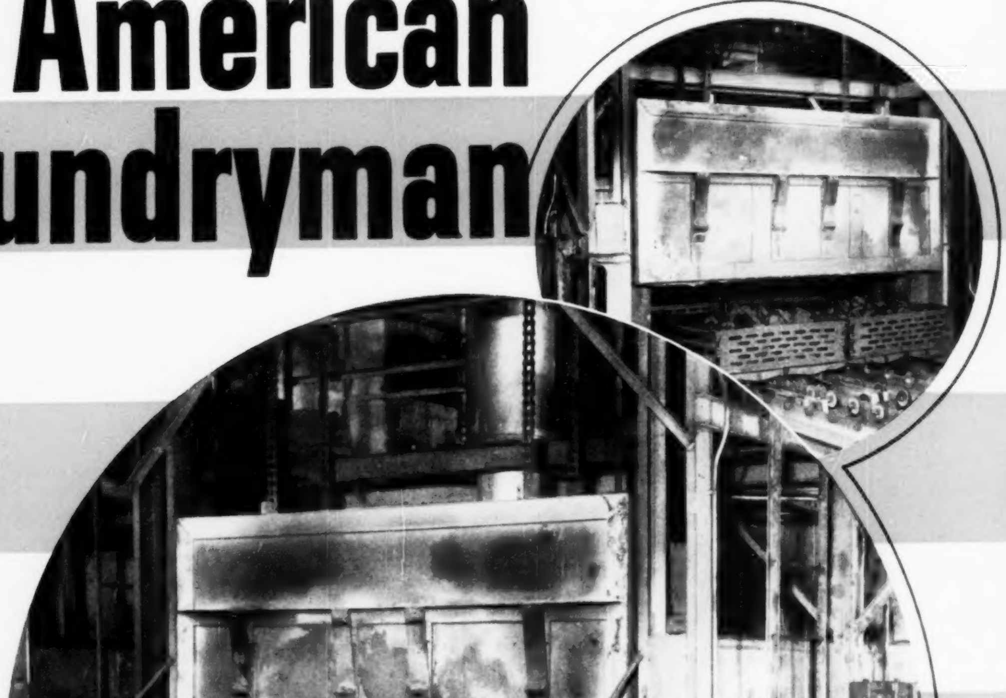
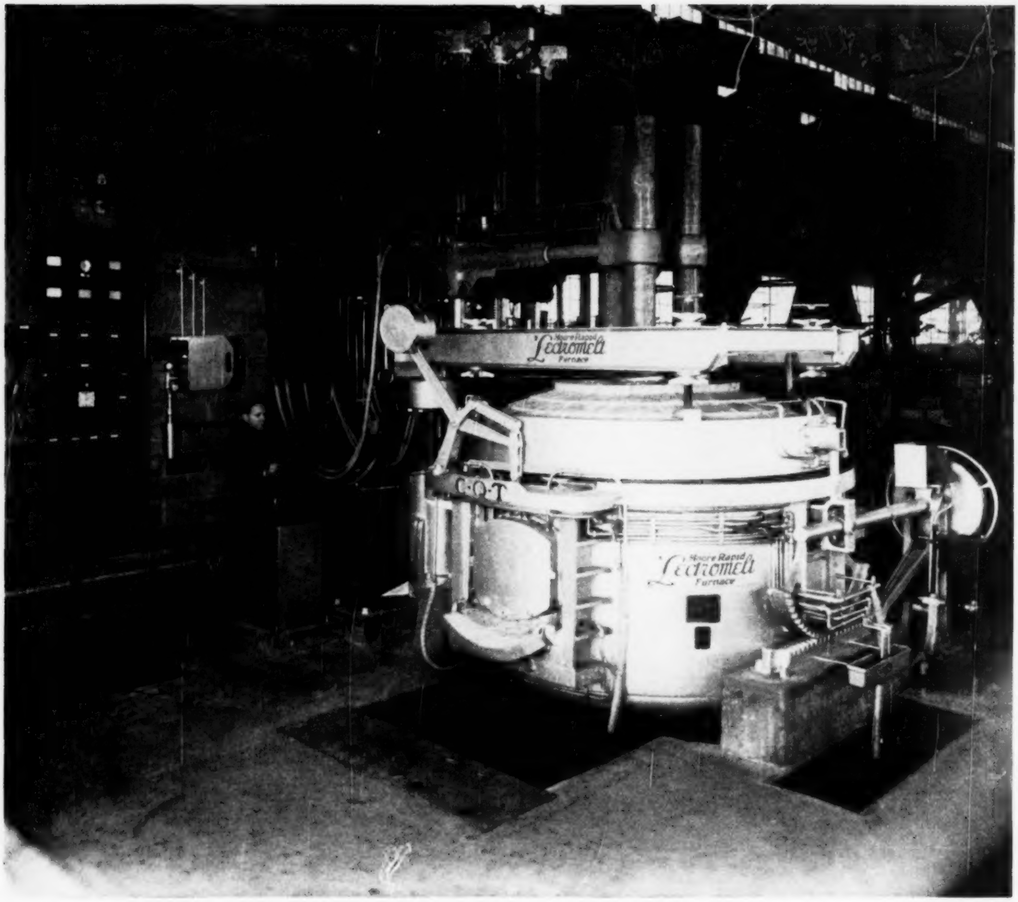
American Foundryman



The Foundrymen's OWN Magazine • January 1950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CONTENTS

VOLUME XVII, NUMBER 1

American Foundryman

January, 1950

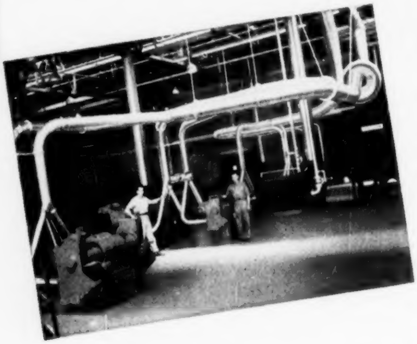
Official publication of American Foundrymen's Society

Continuous drawing of castings in recirculating, roller rail furnace provides constant flow of automotive castings heat treated under well controlled conditions. Cast white, the castings are heated in a controlled atmosphere and held at temperature to remove massive carbides, air or oil quenched, then are pushed into the draw furnace loosely packed in heat resistant boxes on flexible trays. From exit end of furnace (small illustration) castings go to finishing department.

Published monthly by the American Foundrymen's Society, Inc., 222 W. Adams St., Chicago 6. Subscription price in the United States, Canada and Mexico, $3.00 per year; international, $6.00; single copies, 50c. Entered as second class matter July 22, 1938, under act of March 3, 1879, at the Post Office, Chicago, Ill. The American Foundrymen's Society is not responsible for statements or opinions advanced by authors of papers printed in its publication. AMERICAN FOUNDRYMAN is indexed regularly by Engineering Index, Inc.

"CHIPS fall where they may?"

..*but* NOT IN PLANT OF NOTED IMPLEMENT MANUFACTURER



Chipping and Grinding Departments equipped with KIRK & BLUM Dust Collecting Systems . . .

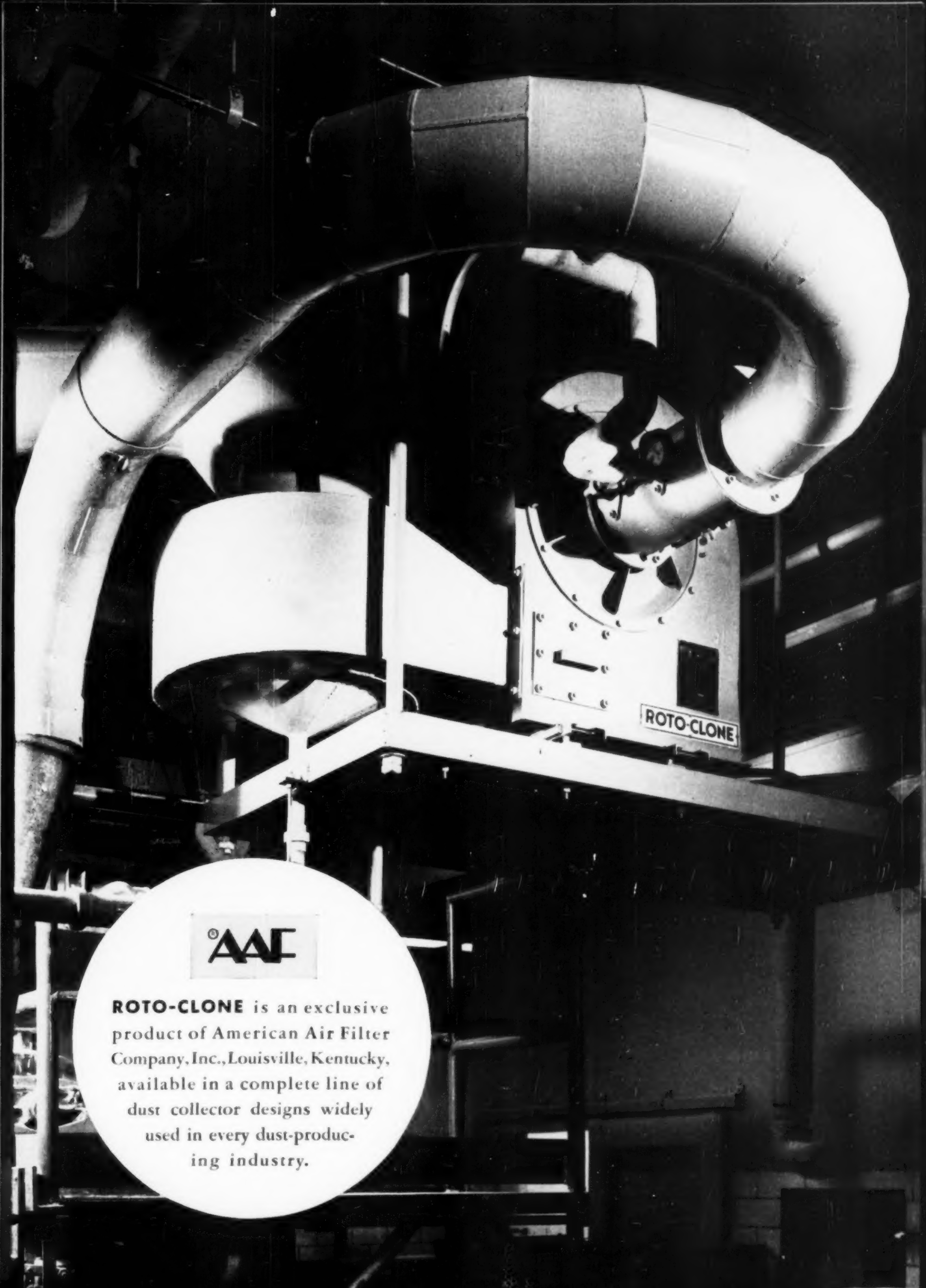
● Today's modern foundry places more and more emphasis on efficient dust collection. A newly constructed Southern foundry containing the most advanced equipment was recently placed in operation by one of the nation's largest manufacturers of farm equipment. Part of the chipping and grinding department of this foundry is illustrated here.

● This noted firm realizes that clean air means greater production, happier and healthier workers, less maintenance and replacement costs on motors and other equipment.

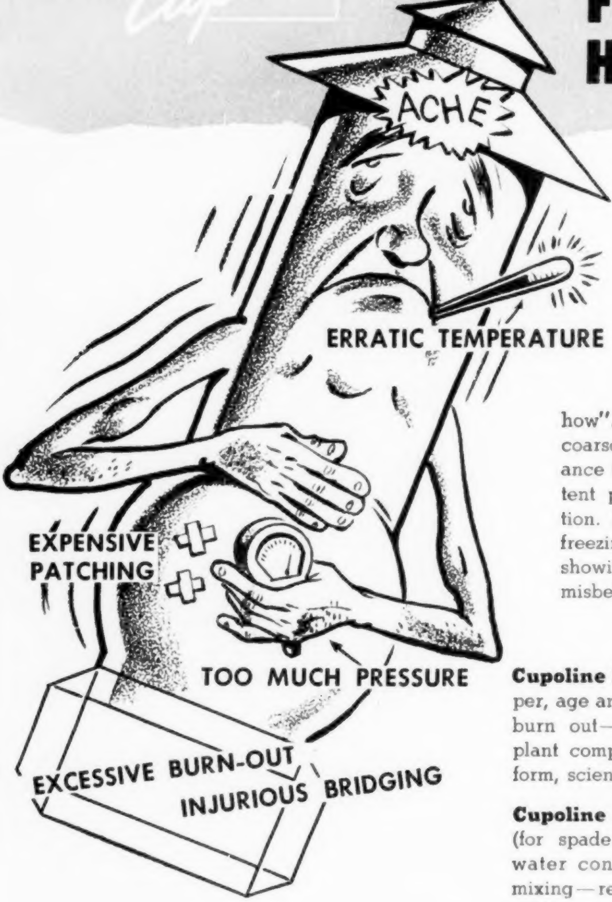
● Besides the systems shown here, KIRK & BLUM built and installed a variety of other systems for dust and fume removal. If you are considering building or remodeling your plant, you can profit from Kirk & Blum experience on this and hundreds of other jobs. Write for free booklet "Dust Collecting System in Metal Industries." *The Kirk & Blum Mfg. Co., 2876 Spring Grove Ave., Cincinnati 25, Ohio.*

FOR CLEAN AIR . . . THE INVISIBLE TOOL

KIRK AND BLUM
DUST CONTROL SYSTEMS


ROTO-CLONE
AAF
ROTO-CLONE is an exclusive product of American Air Filter Company, Inc., Louisville, Kentucky, available in a complete line of dust collector designs widely used in every dust-producing industry.

LET *Cupoline* FREE YOUR CUPOLAS FROM THESE HEADACHES



It's important—this matter of patching cupolas—an essential, not an incidental, in foundry practice. Cheap patching is an extravagance you can't afford. Cupoline, a Cone 33 silica base refractory, was developed by scientific research directed by practical experience plus "know-how". Graded and balanced as to fine and coarse, it has maximum density and resistance to slag penetration. Its low clay content permits minimum water in application. If your cupola has been bridging, freezing up, running erratic chill depth, showing high pressures and otherwise misbehaving, give Cupoline a chance.

★ ★ ★

Cupoline DRY Mix (for hand ramming). Temper, age and ram lightly into place. No joints to burn out—homogeneous patch. No errors in plant compounding, blending or mixing; uniform, scientifically correct mixture.

Cupoline PLASTIC Patching Refractory (for spade tamping). Properly aged—correct water content—no confusing formulae for mixing—ready for use. No weighing, no tempering, no splintered or sharp ganister. Just tamp into place.

BONDACT Mix (for air placement). A dry, screened mix to use in Bondact pressure machine. No need to store dry materials or buy a mixer for patching materials. Optimum combination for air-placement lining and patching.

Let an ECP engineer look into your patching needs.

EASTERN CLAY PRODUCTS, INC., JACKSON, OHIO

ECP

DIXIE BOND • BLACK HILLS BENTONITE • REVIVO BOND • REVIVO SUPER BOND • BALANCED REVIVO

All TYPES OF BONDING CLAYS

A Foundry Sand Service Based Upon Practical Research

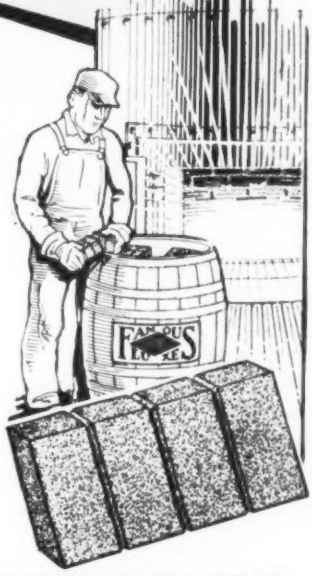


Photo by Toby Chadwick

Profitable New Product Invented by Foundry...

A sound idea, engineering skill, and the *right* Federated metals for its cast components are combined in the LITTCO ELECTRIC MOWER, manufactured by the Littlestown Hardware and Foundry Company, Inc., Littlestown, Pa.

Competent design and liberal use of castings made of Federated aluminum alloys have resulted in the production of a 24 lb. electric lawn mower which, although it requires only one hand to operate, will cut grass up to 15 inches high with no trouble.

Eighteen parts of the mower, including the sides, the housing, wheels, back rollers and brackets, are cast of Federated TENZALOY and Federated F-720, the former being used where extra high strength is demanded.

TENZALOY is produced only by Federated Metals. It is an aluminum alloy which gives high strength without heat treatment, as-cast strengths reaching 30,000 psi., and still higher with 10-14 days aging at room temperature.

For TENZALOY . . . for any non-ferrous alloy, including aluminum, magnesium and copper-base foundry metals; solders; bearing metals; and fabricated lead products . . . see Federated first.

Federated first in the non ferrous field FMD

Federated METALS DIVISION

AMERICAN SMELTING AND REFINING COMPANY, 120 BROADWAY, NEW YORK 5, N.Y.

You Can Save

TIME...MONEY...TROUBLE

with

CAST NICKEL ALLOY STEELS

A fundamental difference exists between alloy steel castings and those of plain carbon steel . . .

The ***unmatched combination*** of properties available in nickel alloy steels, cast to shape, assures superior performance, greater dependability and lower ultimate cost.

MEET EXACTING REQUIREMENTS

Engineering requirements often call for castings with properties that are attainable only by heat treatment. Since castings are generally complex shapes and frequently vary in section thickness, simple normalizing treatments are often practiced. When quenching and tempering are necessary, substantial economies can result from using steels that adequately resist the tendency to warp and crack.

RESPONSE TO HEAT TREATMENT

Cast nickel alloy steels provide basic advantages for fabricator and user, alike. Well beyond the reach of carbon steels are the combinations of strength or hardness and toughness which can be obtained in nickel steel castings by simple normalizing. Their response to mild quenching avoids distortion and cracking, thus permitting the attainment of high strength with adequate ductility in large, cumbersome sections. This simply can't be done with carbon steels.

CONTROLLED IMPROVEMENT

Nickel additions permit controlled improvement of desired properties in steel. Such control has resulted in use of cast nickel steels in main frames for steam locomotives since the early part of this century. High toughness . . . and strength along with ductility . . . are primary requisites in railroad service. Significantly, railroads now are the largest tonnage users of nickel alloy steel castings.

ADVANTAGES OFFERED

Extensive use in oil production, hydroelectric plants, steel rolling and forging, mining, milling, smelting and other heavy industries indicates growing recognition of the following advantages offered by alloy over plain carbon steel castings:

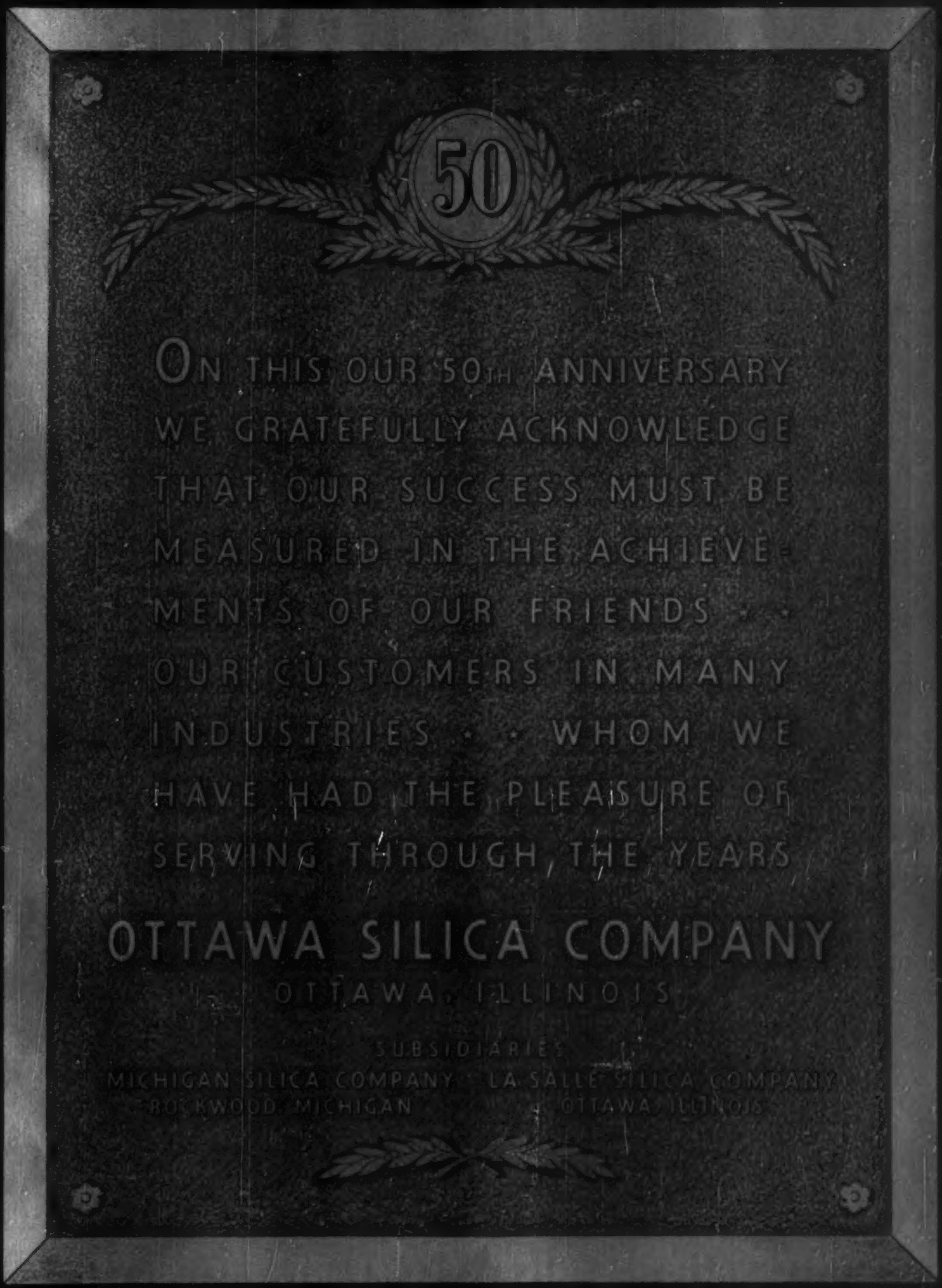
- **Stronger . . . higher yield strength**
- **Less bulk and deadweight**
- **Harder . . . more wear resistant**
- **Better response to heat treatment**
- **Greater shock-resistance**
- **Greater fatigue strength**
- **Less embrittlement at sub-zero temperatures**

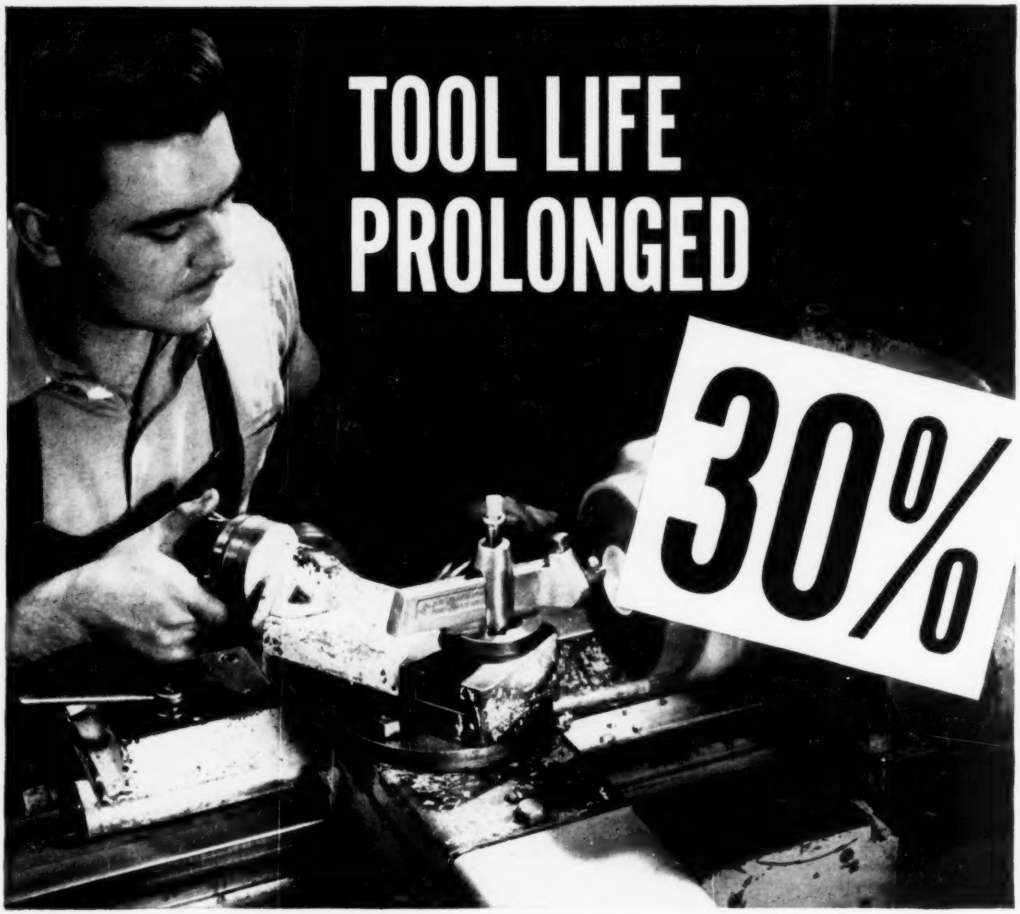
INFORMATION AVAILABLE

May we send you a copy of "Nickel Alloy Steel Castings in Industry". This edition, containing information for users, fabricators, engineers, designers and others, is yours for the asking. Write for it today.

INCO

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.


50
ON THIS OUR 50TH ANNIVERSARY
WE GRATEFULLY ACKNOWLEDGE
THAT OUR SUCCESS MUST BE
MEASURED IN THE ACHIEVE-
MENTS OF OUR FRIENDS . .
OUR CUSTOMERS IN MANY
INDUSTRIES . . WHOM WE
HAVE HAD THE PLEASURE OF
SERVING THROUGH THE YEARS
OTTAWA SILICA COMPANY
OTTAWA, ILLINOIS
SUBSIDIARIES
MICHIGAN SILICA COMPANY
ROCKWOOD, MICHIGAN
LA SALLE SILICA COMPANY
OTTAWA, ILLINOIS



By using FERROCARBO Silicon Carbide briquettes to deoxidize cast iron, it has been found that machinability has been improved to the extent that tools last practically one-third longer. Our metallurgical staff will be pleased to supply complete details or you may obtain the facts by writing direct.

FERROCARBO Briquettes

BY CARBORUNDUM

TRADE MARK

CARBORUNDUM

THE CARBORUNDUM COMPANY, Bonded Products and Abrasive Grain Division, Niagara Falls, New York

FERROCARBO Distributors: Ketchner, Marshall & Co., Pittsburgh, Cleveland, Birmingham, Philadelphia and Buffalo; Miller and Company, Chicago, St. Louis and Cincinnati

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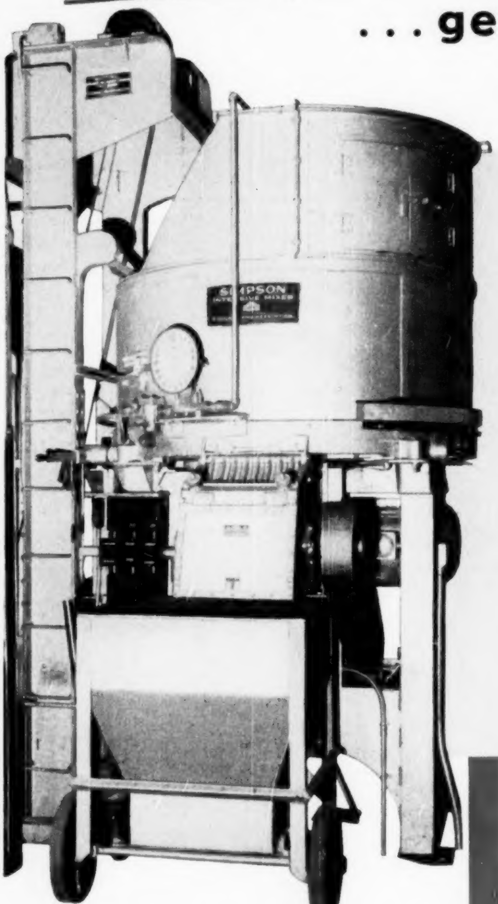
Before you buy any Mixer...

... get the answers to these QUESTIONS:



- What is the *actual* batch size in *pounds* that the mixer will handle on a daily production basis without overloading?
- How many tons of *properly prepared* sand will the mixer produce per hour, per day?
- How much horsepower is required *per ton* of *properly prepared* sand?

UNDER today's conditions, the answers to these important questions are more vital to *efficient* and *profitable* foundry operation than ever before. When you use SIMPSON Intensive Mixers, you'll find that the answers are on the *plus* side . . . with more productive capacity, lower initial cost, and less operating cost . . . based on actual operating data secured on the job in hundreds of foundries all over the country.

Shown at the right are actual capacities of some Simpson Mixer models. For more complete data, ask to have a National Engineer present additional facts and figures. Call or write today.

POUNDS PER HOUR OF PROPERLY PREPARED SAND WITH SIMPSON INTENSIVE MIXERS

SIMPSON MIXER MODEL	MAX. HORSE-POWER	BATCH SIZE IN POUNDS	2 MINUTE CYCLE	3 MINUTE CYCLE
No. 2	20	1,500	45,000	30,000
No. 3	50	3,000	90,000	60,000

Complete details on capacities of other Simpson Mixer models will be furnished on request

SIMPSON
Intensive
MIXERS

NATIONAL *Engineering Company*

600 Machinery Hall Bldg. • Chicago 6, Illinois

Manufacturers and Selling Agents for Continental European Countries—The George Fischer Steel & Iron Works, Schaffhausen, Switzerland. For the British Possessions, Excluding Canada and Australia—August's Limited, Halifax, England. For Canada—Dominion Engineering Co., Ltd., Montreal, Canada. For Australia and New Zealand—Gibson, Battle & Co., Pty., Ltd., Sydney, Australia

PERSONNEL PLANS MADE NOW ASSURE INDUSTRY GROWTH

Castings are more important today than ever before—not only because of the inherent advantages of the founding process—but because of the progressive thinking by the men in the industry. New metals, new production methods, up-to-date engineering, and moderately aggressive selling have kept the foundry industry in the running as one of the five great metal processing industries. But any foundry that does not continue to improve itself in all of these four categories will eventually be lost by the industrial wayside.

There is no alternative but to acquire and develop the best men in industry to improve metals, methods, engineering, and sales if we would remain successful competitors to other metal processes. Too few able recruits to work as molders, patternmakers, supervisors, engineers, salesmen, etc., look to the foundry industry for a career. To increase the number the foundry must seek them in the high schools, trade schools, and colleges. The foundry is no different from other industries in this respect. Each industry, each company, must sell itself to the best young men in these schools in competition with all other businesses and companies.

The most effective way to encourage young men to enter the casting industry is to contact them while they are still in school. Each foundry progressive enough to build up its personnel . . . to make better castings . . . to give better service . . . to sell castings . . . can do no better than to contact the schools and colleges and interview the most promising young men, with a view to recruiting new blood for the industry. Alert foundries and other organizations have already picked the cream of the crop of January graduates and are now recruiting among the June graduates.

Because a good young man has an investment in time and often money in his education, industry should be glad to make an investment in him, too. A little care in the training of high school boys or engineering graduates or apprentices is soon paid off in careful work, diligence, loyalty to the company, and enthusiasm for the foundry as a career.

The A.F.S. Educational Division has prepared material to assist foundries in acquiring and training young men. Some foundries are already using the material and are thus preparing for the increasingly competitive industrial markets. Foundries that wait or fail to recruit young men for production, engineering, and sales will probably regret their inaction.

Most A.F.S. chapters have Educational Committees which, along with the Society's Educational Division, will be glad to advise and assist foundries on recruiting, education, and training problems.

At mid-century foundries should take inventory of their personnel to see whether they are prepared to cope with the technological and competitive problems of the next decade which will see castings become even more important if foundrymen do long-range personnel planning now.

Frederick G. Sefing.

Frederick G. Sefing
National Director
American Foundrymen's Society

National Director F. G. Sefing, research metallurgist, International Nickel Co., New York, has for many years been instrumental in furthering the cause of better foundry education and training. As first chairman of the A.F.S. Educational Division and as head of one of its predecessors, the Committee on Cooperation with Engineering Schools, he has influenced many young men to enter the foundry field. Mr. Sefing is a member of the Gray Iron Division's Advisory Group, a frequent speaker at Society and other foundry meetings and has contributed many articles to the technical foundry literature on such varied subjects as core strengths, grain size, structure of cast iron, and melting of brass and bronze. Holder of a B.S. in metallurgical engineering from Lehigh University (1919) and an M.S. from Pennsylvania State College (1924), his career has included work in both education and industry. He served successively as assistant metallurgist, Hudson Motor Car Co., Detroit; metallurgist, Rockford Drop Forge Co., Rockford, Ill.; chemical metallurgist, Pennsylvania State College; and metallurgist, Michigan State College, prior to joining International Nickel Co. Mr. Sefing's efforts at Michigan State contributed largely to the establishment of the annual Michigan Regional Foundry Conference of A.F.S. He is a past chairman of the Metropolitan Chapter and has been a trustee of the Foundry Educational Foundation from its start in 1947.

TENTATIVE 1950 CONVENTION PROGRAM ANNOUNCED

Record Early Exhibit Applications Indicate Industry-Wide Participation In 1950 Show

Plans for the 1950 A.F.S. Foundry Congress and Show, to be held in Cleveland, May 8-12, 1950, are now reaching final stages of preparation, with a tentative technical program set up, a record number of requests for exhibit space to date, establishment of Convention committees by the host chapter, and a number of new chapter and company entries in the 1950 A.F.S. Apprentice Contest, to be held in conjunction with the Foundry Congress.

Space applications for the 1950 Show are to date running far ahead of early requests for space at any previous Exhibit, demonstrating industry-wide interest and participation in the 1950 Foundry Congress and Show. In addition to many regular exhibitors a number of new companies and their products will be represented for the first time. Three-fourths of the available exhibit space has already been sold and a large number of foundry equipment manufacturers have announced that they will have operating exhibits.

Mail Housing Applications

Convention housing applications and the tentative program (page 23) were mailed to the membership and exhibitors early this month. A folder containing a floor plan of the exhibit halls of Cleveland's Municipal Auditorium, together with Convention rules and regulations, general information and space application blanks has already been mailed to all past and prospective exhibitors.

Tentative program for the 1950 A.F.S. Foundry Congress and Show schedules in addition to five days of technical sessions such Convention highlights as Northeastern Ohio Day, Chapter Officers and Directors Dinner, round table luncheons, Canadian Dinner, Educational Dinner, the Annual Business Meeting and Charles Edgar Hoyt Lecture, the Annual Banquet, and the Gray Iron, and the Sand Shop Courses. New this year is the Non-Ferrous Shop Course, and the "Son-Father" dinner, the latter sponsored by the Non-Ferrous Founders' Society.

Featured event of the Convention's technical program will be the Charles Edgar Hoyt Annual Lecture, presented at the conclusion of the Annual Business Meeting, Wednesday, May 10. This year's lecturer will be W. W. Levi, Lynchburg Foundry Co., Lynchburg, Va., who will speak on "*Operation of the Cupola.*" Other technical program highlights will be presentation of the 1950 Exchange Paper of the Institute of British Foundrymen, "*Aluminum Alloy Castings—A Review of British Achievements,*" by Frank Hudson, Mond Nickel Co., Ltd.; and the Exchange Paper of the French Foundry Technical Association, which will be presented by Jean Maurice Laine, Technical Secretary, French Foundry Technical Association.

The Aluminum & Magnesium Division's two-day program will feature four technical sessions on May 8 and 9, the Aluminum and Magnesium Round Table Luncheon on Monday, May 8; and participation in the Non-Ferrous Shop Course, held the evenings of May 8 and 9 and open to all foundrymen of the Cleveland area, as well as to Convention registrants. The Division's program will cover magnesium fluxing, fluid flow in transparent molds, high strength magnesium alloys, Canadian magnesium casting practices, and non-ferrous metal practice.

W. W. Levi, *this year's Charles Edgar Hoyt Annual Lecturer will speak on cupola operation following the Annual Business Meeting of the 1950 A.F.S. Foundry Congress and Show. An authority on cupola practice and a leading gray iron metallurgist, he studied in the United States and abroad, and is on several Gray Iron Division committees of the Society.*

A.F.S. Brass & Bronze Division has scheduled four technical sessions on May 8 and 9, the annual Brass & Bronze Round Table Luncheon on May 9 and the new Non-Ferrous Shop Course.

Malleable Division's Convention schedule calls for

two technical sessions on Monday, May 8, one session Tuesday morning, the Malleable Round Table Luncheon Tuesday noon, and joint sponsorship with the Gray Iron Division of a symposium on nodular iron, Wednesday morning, May 10.

Gray Iron Division's program opens Wednesday morning, May 10, with the symposium on nodular iron held in conjunction with the Malleable Division, followed by the Gray Iron Round Table Luncheon. Technical sessions continue Thursday morning, May 11, and carry on through the final day of the Convention. The popular Gray Iron Shop Course—like

Tentative Schedule of Sessions

1950 A.F.S. Foundry Congress and Show

Cleveland — May 8-12

Monday, May 8

10:00 a.m.	Registration Begins
	Exhibits Open
	Technical Sessions
	Aluminum & Magnesium
	Brass & Bronze
	Malleable
12:00 noon	Aluminum & Magnesium Round Table Luncheon
1:00 p.m.	Northeastern Ohio Day — free admission for local plant men
2:00 p.m.	Technical Sessions
	Brass & Bronze
	Malleable
	Precision Casting
4:00 p.m.	Technical Sessions
	Aluminum & Magnesium
	Brass & Bronze
6:30 p.m.	Non-Ferrous "Son-Father" Dinner (Sponsored by NFFS)
7:00 p.m.	**Chapter Officers & Directors Dinner**
8:00 p.m.	Technical Sessions
	Gray Iron Shop Course
	Sand Shop Course
	Non-Ferrous Shop Course
9:30 p.m.	Exhibits Close

Tuesday, May 9

9:00 a.m.	Registration Opens
	Exhibits Open
10:00 a.m.	Technical Sessions
	Heat Transfer
	Aluminum & Magnesium
	Brass & Bronze
	Malleable
12:00 noon	Brass & Bronze Round Table Luncheon
	Malleable Round Table Luncheon
2:00 p.m.	Technical Sessions
	Aluminum & Magnesium
	Sand
	Joint Sand & Steel
4:00 p.m.	Technical Sessions
	Brass & Bronze
	Pattern
	Educational
	Aluminum & Magnesium
5:30 p.m.	Exhibits Close
7:30 p.m.	**Canadian Dinner**
	Educational Dinner
8:00 p.m.	Technical Sessions
	Gray Iron Shop Course
	Sand Shop Course
	Non-Ferrous Shop Course

Wednesday, May 10

9:00 a.m.	Registration Opens
	Exhibits Open
10:00 a.m.	Technical Sessions
	Sand
	Joint Gray Iron & Malleable
	Refractories
12:00 noon	Pattern Round Table Luncheon
	Gray Iron Round Table Luncheon
3:00 p.m.	Exhibits Close
	Annual Business Meeting
4:00 p.m.	**Charles Edgar Hoyt Annual Lecture**
7:00 p.m.	**Annual A.F.S. Banquet**

Thursday, May 11

9:00 a.m.	Registration Opens
	Exhibits Open
10:00 a.m.	Technical Sessions
	Management Functions & Controls
	Gray Iron
	Steel
	Sand
12:00 noon	Steel Round Table Luncheon
2:00 p.m.	Technical Sessions
	Time Study & Methods
	Gray Iron
4:00 p.m.	Technical Sessions
	Steel
	Gray Iron
	Plant & Plant Equipment
	Cost
5:30 p.m.	Exhibits Close
7:00 p.m.	**A.F.S. Alumni Dinner** (invitational)
8:00 p.m.	Technical Sessions
	Plant & Plant Equipment
	Gray Iron Shop Course
	Sand Shop Course

Friday, May 12

9:00 a.m.	Registration Opens
	Exhibits Open
10:00 a.m.	Technical Sessions
	Gray Iron
	Steel
2:00 p.m.	Technical Sessions
	Gray Iron
	Steel
4:00 p.m.	Technical Sessions
	Gray Iron
	Steel
4:30 p.m.	Exhibits Close

all shop courses open to Cleveland foundrymen and Convention registrants—will be held at 8 p.m. the evenings of May 8, 9, and 11, and will cover pouring practices, bedding, and patching and lining.

Sand Division will hold technical sessions the mornings of May 9, 10, and 11 and the Sand Shop Course the evenings of May 8, 9, and 11. The Division will sponsor a meeting May 9 with the Steel Division.

Steel Division's technical program will open Thursday morning, May 11, and continue through Friday afternoon, and will feature the annual Steel Round Table Luncheon. Included in the program and jointly sponsored by the Sand Division will be a Symposium on Interpretation and Application of Sand Test Data for the Production of Quality Steel Castings.

Pattern Division's Convention schedule calls for a technical session the afternoon of May 9 and the Pattern Round Table Luncheon at noon on May 10.

Educational Division's program includes one technical session Tuesday afternoon, May 9, and the annual Educational Dinner that evening.

Other technical meetings scheduled for the 1950 Foundry Congress and Show are a session on Heat Transfer Tuesday morning, May 9; a Refractories session the morning of May 10; a joint session of the A.F.S. Time Study & Methods and Cost Committees on management functions and controls Thursday morning, May 11; a Time Study & Methods meeting the afternoon of May 11; and two sessions sponsored by the Plant and Plant Equipment Committee the afternoon and evening of May 11; a meeting on precision casting May 8; and on foundry cost methods May 11.

27th Annual Apprentice Contest

The 1950 A.F.S. Apprentice Contest, held annually in conjunction with the Convention, will continue until late in March when the National Judging will take place in Cleveland. First place winners in the five contest divisions—Gray Iron Molding, Steel Molding, Non-Ferrous Molding, Wood Patternmaking, and Metal Patternmaking (new this year)—will have their round trip rail and Pullman fare paid to the Convention, where A.F.S. National President E. W. Horlebein will award them $100 prizes.

Any apprentice is eligible to enter the 1950 A.F.S. Apprentice Contest, provided he is taking a regular training course of not less than three years' duration and is not over 24 years old on the day he makes his pattern or mold. For veterans the age limit is 24 plus length of service in the Armed Forces. Further Contest information may be obtained from Jos. E. Foster, Technical Assistant, American Foundrymen's Society, 222 West Adams St., Chicago 6, Ill.

Name Host Committee Chairmen

A.F.S. Northeastern Ohio Chapter Convention committee chairmen are:

Reception: chairman, Cleve H. Pomeroy, National Malleable & Steel Castings Co.; vice-chairman, Walter L. Seelbach, Superior Foundry, Inc.

Northeastern Ohio Day: chairman, John A. Sharritts, Westinghouse Electric Corp.; vice-chairman, Leslie Schuman, National Malleable & Steel Castings Co.

Plant Visitations: chairman, Lewis T. Crosby, Sterling Wheelbarrow Co.; vice-chairman, John Schneider, Cleveland Electric Illuminating Co.

Shop Courses: chairman, National Director Vincent J. Sedlon, Master Pattern Co.; vice-chairman, Maurice F. Degley, Ferro Machine & Foundry Co.

Banquet: chairman, Gilbert J. Nock, Nock Fire Brick Co.; vice-chairman, Russell F. Lincoln, Russell F. Lincoln & Co.

Ladies' Entertainment: chairman, Mrs. Frank G. Steinebach; vice-chairman, Mrs. Gilbert J. Nock.

Publicity: chairman, Robert H. Herrmann, Penton Publishing Co.; vice-chairman, Sterling N. Farmer, Sand Products Corp.

As previously announced, members of the host chapter's General Committee are: honorary chairman, A.F.S. National Vice-President Walton L. Woody; chairman, Wm. G. Gude, Penton Publishing Co.; vice-chairman, Fred J. Pfarr, Lake City Malleable Co.; secretary, A. J. Harlan, Hickman, Williams & Co.; treasurer, F. Ray Fleig, Smith Facing & Supply Co.; W. E. Sicha, Aluminum Co. of America; H. C. Gollmar, Elyria Foundry Division; and H. J. Trenkamp, Ohio Foundry Co. Complete personnel of these committees will be announced in a future issue of AMERICAN FOUNDRYMAN.

Great Lakes iron ore boats bring the raw material for pig iron and steel to Cleveland.

TRIPLE-GROOVE SHEAVE CASTING PRESENTS RIGGING PROBLEMS

Gating and Risering Committee Makes a Survey

N. A. Birch
Chairman
Gating and Risering Committee
A.F.S. Gray Iron Division

One of the more confusing experiences which the foundry trainee has to live through comes when he asks for advice on how to rig his first casting. There may be one cupola expert in the shop, and one sand man, but everybody has an opinion on gating and risering and is usually more than willing to share it. The confusion arises when the trainee finds that the opinions are all different. This situation is inherent in the foundry and probably with good reason, since gating and risering is the common meeting ground for all who have to do with the production of castings.

Since individual opinion differs so widely, the Gating and Risering Committee decided to attempt a survey to sample the current thinking of gray iron foundries on gating and risering. It was not anticipated that the survey would have definite value (since there is no such thing as "right" and "wrong" in rigging) but at least the returns would form an interesting basis for discussion and each foundryman could use them as an individual "measuring stick" to determine whether he was with or against the majority.

The problem casting is a triple-groove V-belt sheave of 9-in. pitch diameter (Fig. 1) and was selected from a group of 56 entries. All dimensions are standard for stock sheave sizes as given in the manufacturer's catalog, except that the manufacturer apparently purchases the sheaves with a solid hub to be bored out later.

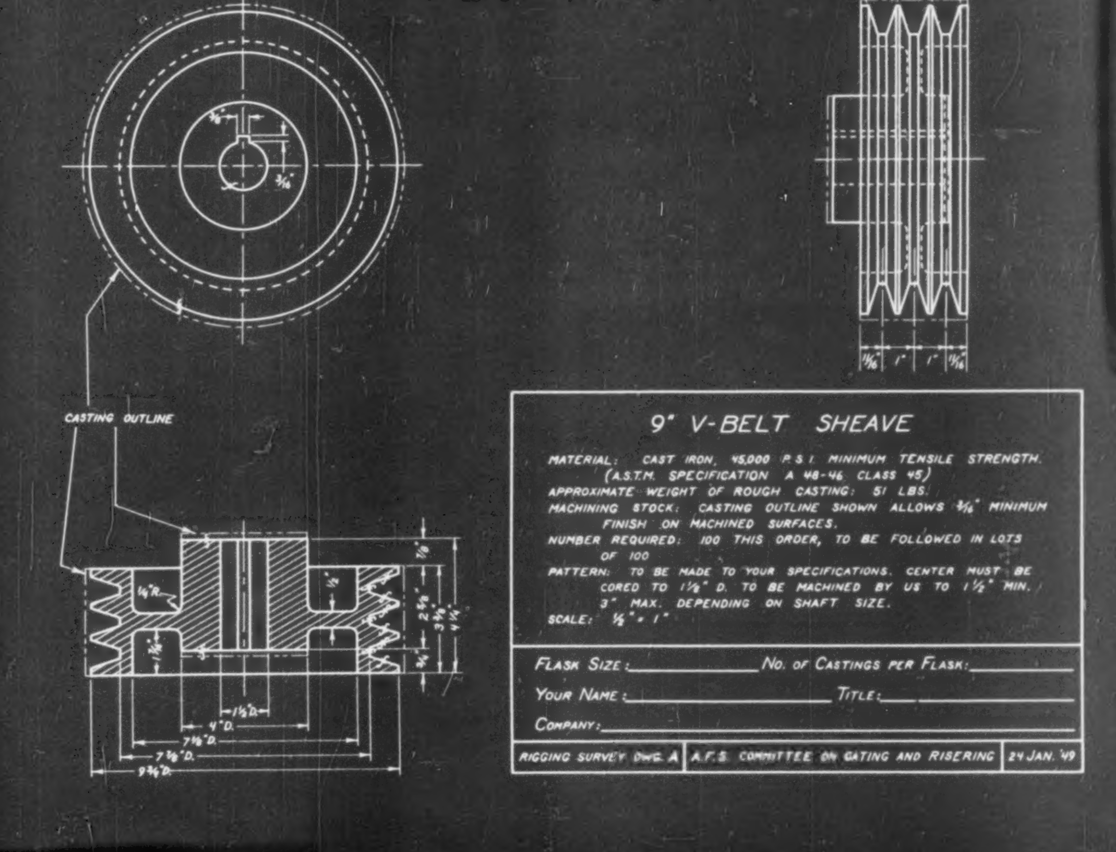


Fig. 1—The problem casting (reproduction of rigging survey drawing "A").

Design considerations which influenced the committee in choosing this pattern included:

1. The deep middle groove extending into a T-section which would be a potential shrink area whether the rim was made solid or cored.

2. The thin web which separates the two heavy sections of the casting and would interfere with feeding from one heavy section to the other.

3. The offset hub makes it easy to clean gates or risers from one side and difficult from the other.

4. The committee added the center core (and was criticized in the returns) with the sole purpose of making risering of the hub more difficult.

Figure 2 is a photograph of wood models of the problem casting, including a cross section painted to show the finish-machined sheave dimensions. In Fig. 1 the rough casting was shown to have a solid flange, but it was not specified that the grooves could not be cored if the foundry so desired. The survey drawing also specified a Class 45 iron, indicated that orders

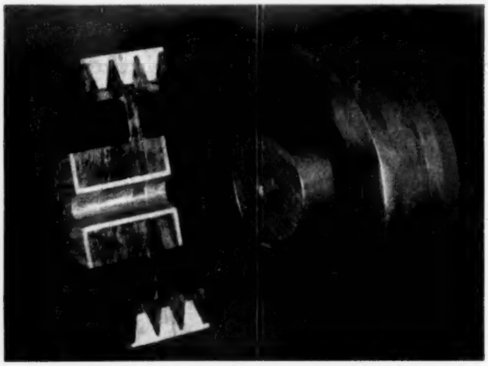


Fig. 2—Wood models of the problem casting. Section at the left is painted to show the finish machined sheave (dark) with the machining stock (light areas).

Fig. 3—Top center gate with riser. White cardboard on model represents metal; cross-hatched areas the core.

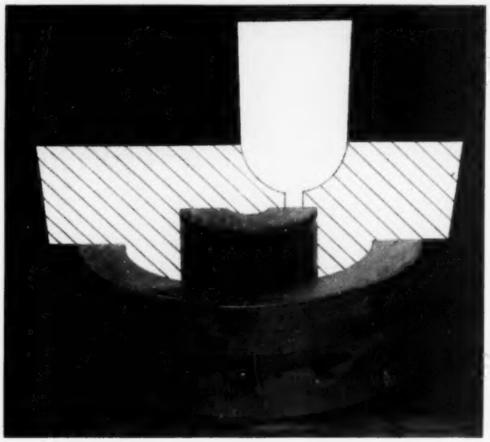


Fig. 4—Top center gate with necked-down riser (single sprue). Casting is made in the drag, with a cover core.

would be in lots of 100 castings and permitted the foundry to make pattern equipment to suit themselves.

Thomas' *Register of Manufacturers* lists approximately 1300 producers of gray iron castings in the country. To assure impartial distribution of the survey, these were divided geographically into groups of about 250 each, and further subdivided by capital assets so that a proportionate number of large, medium, and small foundries received the survey. In all, 450 copies of the survey were mailed and 62 replies (or about 14 per cent) were received.

Distribution of the Survey and Returns

Surprisingly enough, the returns appear to be statistical; that is, foundrymen in the south and west were equally as willing to commit themselves as those in the midwest and in the New England states. Likewise, the large and small foundries answered about proportionately, with 35 replies coming from foundries with over $500,000 capital assets, 20 in the group between $100,000 and $500,000, and the remainder in the small foundry class.

Who answered the survey? One of the questions included the title of the man actually filling out the rigging details, and if the replies are an indication of who does the gating and risering in the average foundry, the results are revealing. The list of titles ranges from president to foundry trainee.

In between these obvious extremes, the titles included general manager, foundry superintendent, metallurgist, engineer, molding superintendent, general foreman, shop planner, pattern shop foreman, foreman, and layout man. There was no return from anyone with the title "rigging supervisor"—perhaps there is no such title in the industry. The largest single group to reply included 22 with titles of foundry superintendent or foundry supervisor. Considering general managers and superintendents as a class, this number increased to 33, and represents about one half the total number of replies.

What did these people do with the problem casting?

Table 1 shows the answer in general terms. Fully three-quarters confirmed the committee's unofficial opinion that some form of risering was desirable.

Classification of Replies

The Center-Gaters: About one-quarter would have gated through some form of top center riser on the hub, as illustrated in Fig. 3. A wafer or neck-down core to provide a knock-off riser was the great favorite with this group. The risers were generally 3 to 4 in. in diameter and 3 to 6 in. in height, although one foundryman thought only 1½ in. of height was necessary. The biggest variation was in the number, size and shape of the holes to be used in the neck-down core. Most sketches showed from five to eight ¼ or ⅜ in. diameter holes or "pencil gates" through which the metal entered the mold cavity, while some used two or three elongated slots.

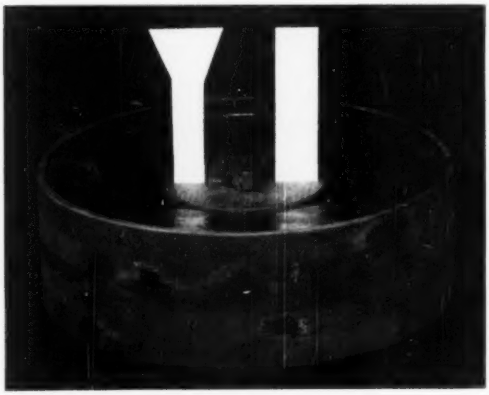
Several entries added the refinement of a core sand pouring basin with a dam or strainer core, but the majority chose to pour directly onto the knock-off core. The minority in this group (three replies) elected to gate into the hub through a single necked-down riser, as shown in Fig. 4. All of the group were in complete accord on at least one matter—with gating through a center riser there was no need for separate risers at the flange (although only three decided to lighten the flange by coring the grooves).

The next easily identified group consisted of those foundrymen who decided to gate into the hub but without risering. They represented 11 per cent of the

Table 1—Classification of Returns
(Rigging Survey Drawing "A")

Type of Gating	Number	Per Cent
Top Center Gate With Riser	17	27
Center Gate Without Riser	7	11
Edge Gate, Risered	24	39
Edge Gate, Not Risered	6	10
Non-Conformists	8	13
Total	62	100
Number Recommending Risers to Feed	46	74
Number Recommending Gating Through Risers	36	
Number Recommending No Risers	16	26

Fig. 5—Casting is center-gated without riser. Downsprue is shown on the left, and "flow-off" on the right.



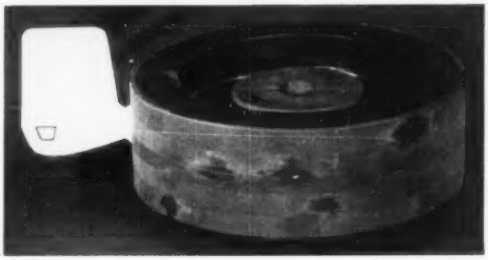
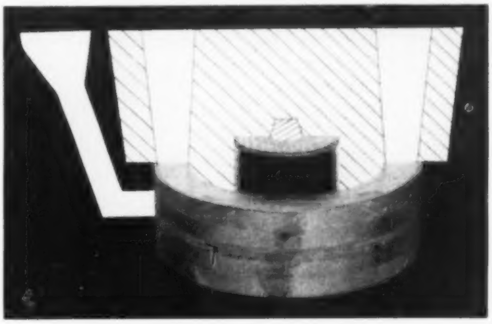


Fig. 6—Edge gate through riser. Split pattern with blind head in cope, pad and runner in drag. Size of runner is shown at point where it enters the riser.

Fig. 7—Edge gate with four top risers. The casting is made all in the drag, with the downsprue at the left as a ram-up core, and the risers in the cover core.



replies, and Fig. 5 shows a typical entry. Some sketches showed the two gate members labeled "sprue" and "riser," but the dimensions of the latter were less than could be expected to provide feed metal to the casting, and in classifying the survey it has been considered merely as a "flow off." One foundryman in this group gated the metal through a ½ in. diameter horn gate to the bottom of the hub. All, again, were agreed that there was no need for risering the flange.

The Edge-Gaters: The third and most popular method of gating the problem casting was to bring the metal in at the flange through some type of riser, as illustrated in Fig. 6. Only three foundrymen chose to challenge the generally accepted practice of riser gating (to promote directional solidification) by bringing the metal in at one edge and having "cold metal risers" at the opposite side of the casting. The preference was two to one in favor of blind risers.

Blind risers were generally of 3-in. diameter, with one sketch showing the interesting combination of an atmospheric blind riser connected to the casting through a knock-off core. This is in contrast to the popular opinion that atmospheric blind risers are unnecessary with gray iron because of lack of skin formation on the metal. About one third of the group used core pouring basins or strainer cores or both, but the majority depended upon choking in the runner to keep the casting clean.

On the matter of risering, the edge-gaters were almost as certain as the center-gaters—since they ris-

ered the edge, there was no necessity for separately risering the center. The two exceptions were one president and a metallurgist who added an open riser at the hub in addition to riser-gating at the edge. This group also included the only entrant to use chills and he put ring chills on the hub, both cope and drag.

Figure 7 shows a rigging employing four wedge-risers in a cover core with the metal entering through a rammed-up core gate. Most edge-gaters who risered apparently believed that one riser per casting was sufficient, and those few who used two risers per casting were more than counterbalanced by those who clustered two or four castings around a single riser.

About equal in number to those who center-gated without risering were those who edge-gated without risering, as shown in Fig. 8. These men apparently did not believe the casting requirements too difficult. They merely brought the metal into the mold cavity at the edge through thin gates, and only two specified flow-offs. The casting yield for this group would have been at least 85 per cent. One foundry superintendent specified a "1/8 in. extra height on the cope side of the hub for top shrinkage."

The Non-Conformists: This last group shown in Table 1 consists of eight individualists (13 per cent of replies) who have been classed together as non-conformists and Fig. 9 shows one of these gating systems. There are four castings per flask, made with

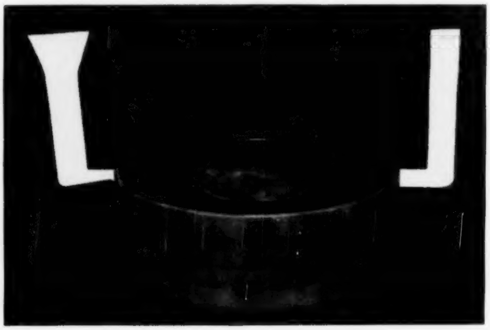


Fig. 8—This is an example of edge-gating without risers. Downsprue is shown at left, and "flow-off" at right.

Fig. 9—Sample of "non-conformist" rigging. Four castings per flask, flange and gating all in cope. Metal enters each mold cavity through two tangential gates. Each casting has a knock-off riser on the hub (right).

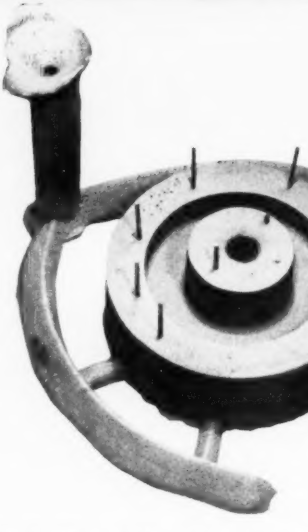


Fig. 10—The sample casting was made without risers, and with flange and hand-cut gating all in the cope.

the flange in the cope so that the metal enters the mold cavity at the bottom, and with a knock-off riser at the center. Accompanying the sketch was an excellent letter outlining the plant's normal routine of pilot casting inspection by x-ray and sectioning to determine the need for risering. Included in the letter was a criticism (which appeared in several replies) that the foundryman was being penalized by the 1 1/8 in. core in the hub, and also that the web thickness of 1/2 in. might prove too thin for good design and should preferably be more nearly equalized with other sections.

Two non-conformists top-gated with a single sprue running through the pocket of sand between the hub and the flange directly into the web, apparently not too concerned with the problem of clean-up, and two others edge-gated through two sprues and poured each casting simultaneously from two ladles. Another non-conformist bottom-gated at eight locations at the flange through a ram-up core sand ring runner and added two top risers at the hub.

In brief summary of the riser controversy, three out of four decided that risers were necessary and most of these followed the principle of riser-gating to promote directional solidification. One out of four decided that risers were unnecessary and gated into hub and flange, top and bottom, and even into the web.

Table 2—Pattern Equipment and Molding
(Rigging Survey Drawing "A")

		Center Gaters		Edge Gaters				
Item	Choice	With Riser	Without Riser	With Riser	Without Riser	Non-Conformists	No.	Total Per Cent
Sheave Grooves	Made solid	14	4	24	5	8	55	89
	Cored out	3	3	0	1	0	7	11
Hub Projection	Made up	13	1	2	0	4	20	32
	Made down	4	6	22	6	4	42	68
Casting Made In	Cope	0	0	0	0	2	2	3
	Drag	12	6	18	6	6	48	77
	Split	5	1	6	0	0	12	20
No. of Castings per flask	One	17	7	15	5	7	51	82
	Two	0	0	6	0	0	6	10
	Three	0	0	0	0	0	0	—
	Four	0	0	3	1	1	5	8

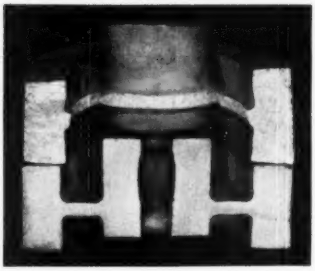


Fig. 11—Sample casting. Lower half cut and etched; other half with hub broken from flange and flange fractured. No shrinkage, porosity nor weakness was noted. Poured at 2400 F.

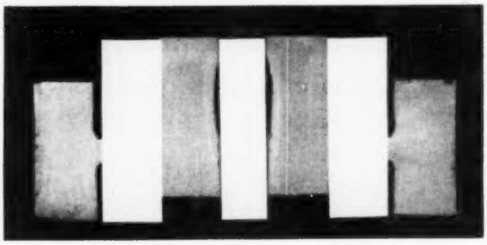


Fig. 12—Etched half of sample casting. Edges of white cardboard are straight and parallel. Note surface "sink" which occurred in cored hole in hub and also at the base of fillets where the web joins the flange.

Table 2 summarizes the various choices in pattern equipment and molding. Most foundrymen made the sheave grooves solid, probably because the rough casting outline so indicated on the drawing. The first preference was to make the casting in the drag, some made a split pattern and only two non-conformists made the casting in the cope. One sketch showed only the projecting hub as a loose piece to avoid drawing the deeper of the two pockets.

For some reason six foundries used a cover core, as illustrated in Figs. 4 and 7, although only two made the obvious saving of using a weight to hold it down instead of a cope. Three others were afraid of the pocket and used ram-up cores for both cope and drag.

The large majority made only one casting per flask, with sizes running from 12 to 18 in. square, with cope and drag heights varying from 4 in. to 10 in. depending on choice of gating. Five people (all center-gaters) preferred a 12 to 18 in. round flask, apparently to save sand and molding time. Those who made more than one casting per flask were all edge-gaters (and one non-conformist) and flask sizes were generally 14 by 26 in. for two and 24 in. square to 31 in. square for four castings. Cope and drag heights were 5 and 6 in.

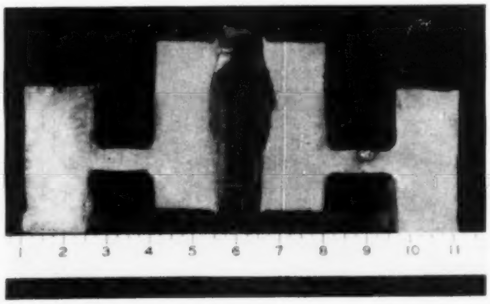


Fig. 13—Remake of sample casting, sectioned and etched, gating same as Fig. 10. Pouring temperature, 2500F. Casting had hot tears in flange fillets, surface shrinkage in the web, and excessive sink at the bore.

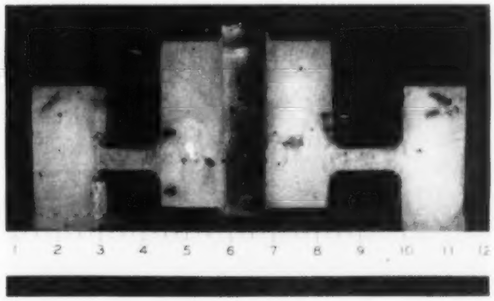
The Committee Makes a Sample Casting

Finding that at least one fourth of the replies indicated no risers, a somewhat prejudiced committee hastily made a sample casting without risers, with the firm intention of demonstrating that shrinkage would be present at the hub or flange or both. The pattern was the solid wood model shown in Fig. 2 rammed up all in the cope in green sand with a $1\frac{1}{8}$-inch stock core. The hand-cut gating was also all in the cope (as were the small surface blows evident in a photograph of the casting, Fig. 10). The gating was intended merely to permit pouring the casting quickly, to minimize hot spots at the points of metal entry. On cutting the casting in half, there was no evidence of centerline shrinkage at the T-sections.

Etching one half and fracturing the other, as shown in Fig. 11, failed to disclose any shrinkage, porosity or weakness. Brinell hardness readings on a cross section showed 170 and 179 at the T-sections where shrinkage might be expected, and 179 to 187 at other parts of the hub flange. The casting was poured of cupola-melted iron at 2400F (optical pyrometer) in about 4 sec. Percentage composition was total carbon, 3.32; manganese, 0.80, phosphorus, 0.182, sulphur, 0.116, and silicon, 1.50. Gross weight was 71.0 lb and net weight 52.8 lb, for a casting yield of 74 per cent.

The explanation for the unexpected soundness of the casting is perhaps best evident from a close study of Fig. 12, where pieces of cardboard with parallel straight sides were placed in the cored hole and the pockets. The hub is sound because it is self-risering, but not at the top as one foundryman anticipated. The center core apparently picked up and retained enough heat to cause the metal adjacent to it to be

Fig. 14—Remake of sample casting, sectioned and etched, gating same as Fig. 10. Poured at 2370F. Casting has scattered shrinkage throughout. Cold pouring prevented sink formation at center core (Fig. 13).



the last to solidify, resulting in a sound hub but with a surface sink in the cored hole. Quite conveniently, the sink area is only 1/4 in. larger than the core diameter, and is within the machining stock allowance provided.

The flange is likewise sound because of self-risering, but the sink is less evident and occurs at the fillet between web and flange. The inside surface of the flange originally had slight draft to permit drawing the pockets, but the casting actually shows backdraft because of sink at the fillets. And by actual measurement the web thickness was 1/16 inch less at the base of both hub and flange fillets than at the midpoint. This is circumstantial evidence that the web solidified before the hub or flange, and that feeding through it would have been impossible. The flange sink is also in a non-critical location, permitting the sheave grooves to be machined in sound metal. Quite unintentionally and contrary to majority opinion, the committee had made a sound casting without risers.

Committee Casting Criticized

Foundrymen present at the 1949 Gray Iron Round Table Luncheon proved to be 100 per cent riser-minded, and about equally divided between edge-gaters and center-gaters. They criticized the committee's unexpected casting on three counts: (1) that it was not true to pattern, because of the sinks; (2) that the casting analysis was more nearly Class 40 instead of Class 45 iron; (3) that attempting to duplicate the result in production would be practically impossible.

To reach a more definite conclusion, committee members made additional castings in five different shops, using the gating shown in Fig. 10. The results were spotty and generally unsatisfactory. Figures 13 and 14, for example, shown the effect of 130F variation in pouring temperature. The defects ranged from excessive surface sinks and shrinkage on the hot-poured casting to extreme internal porosity on the cold-poured one. The metal in this instance analyzed: total carbon, 2.99, manganese, 0.80, phosphorus, 0.097, sulphur, 0.115, and silicon, 1.59 per cent. Tensile strength specimens from a 1.2 in. arbitration bar averaged 52,300 psi at 228 BHN.

Summary

Replies received in the rigging survey indicated that three out of four foundrymen would have risered the problem casting to meet customer requirements. Table 1 shows in more detail that approximately one half of those answering the survey would have gated the casting from the side, and almost all of these would have used an edge gate with a riser. Forty per cent of the replies were in favor of gating at the center, and more than half of these would have used a riser with a top center gate.

While it was not the intent of the survey to have the participants prove themselves, the committee believed that the one-in-four foundryman who would not have risered the casting was entitled to a chance to prove his point. A first sample casting made without risers proved to be sound (Figs. 10, 11 and 12) although of doubtful quality in certain other respects.

Additional castings made without risers showed conclusively that the volume shrinkage inherent with solidification cannot be denied and will, in these castings, show up either as a surface collapse (Fig. 13) or as internal porosity (Fig. 14). In accordance with majority opinion, some form of risering is definitely necessary with this type of casting.

Members of the A.F.S. Gating and Risering Committee are: Norman A. Birch, chairman, National Bearing Div., American Brake Shoe Co., Meadville, N. J.; Graham T. Hassard, Farrell-Birmingham Co., Ansonia, Conn.; William T. Maher, Barnett Foundry & Machine Co., Irvington, N. J.; T. C. Jester, Darling Valve and Manufacturing Co., Williamsport, Pa.; Charles W. Mooney, Olney Foundry Div., Link-Belt Co., Philadelphia; Howard F. Taylor, Massachusetts Institute of Technology, Cambridge, Mass.; A. S. Wright, Standard Foundry Co., Worcester, Mass.

Approve Michigan State College Student Chapter, Eighth In A.F.S.

Approval by the A.F.S. Board of Directors has been given for the formation of the Michigan State College Student Chapter of the Society and the new group will be installed soon. The eighth student chapter, the group was formed with the cooperation of college faculty members headed by C. C. Sigerfoos and members of the Central Michigan Chapter under the chairmanship of Fitz Coughlin, Jr., Albion Malleable Iron Co., Albion, Mich. Industrial advisor to the student chapter is Albion Malleable's president, Collins L. Carter; faculty advisor is Austen J. Smith.

Full cooperation of the Central Michigan Chapter has been offered. Student members have been placed on the industrial chapter's mailing list and can attend chapter dinners at half price.

Officers of the Michigan State College Student Chapter are: Edward H. Fauth, chairman; Donald I. Huizenga, vice-chairman; and Fred W. Schwier, secretary-treasurer. Huizenga transferred from the Central Michigan Chapter on formation of the student organization. He is receiving financial assistance for his education through the Western Michigan Chapter's Donald J. Campbell Educational Fund.

Students signing the petition for recognition as an A.F.S. chapter include: Robert F. Bentley, Richard L. Charnesky, Arthur Craig, Donald F. Davis, Calvin B. Dewey, William I. Dieters, Willard G. Engelgau, Samuel S. Fair, Jerald A. Haynes, Frederick W. Hyslop, Robert H. Klemm, and Carl L. Langenberg.

Others are Stanley D. Mackey, Martin A. Molnar, Jawdat I. Nubani, James W. Ogilvy, William J. Pierszalowski, Kenneth E. Spray, Jack T. Steinbacher, and Richard R. Studor.

WISCONSIN, BIRMINGHAM REGIONALS IN FEBRUARY

Two chapters, Birmingham District and Wisconsin, which traditionally hold regional foundry conferences in February have scheduled their meetings for February 2-4 and February 9-10, respectively. A.F.S. National President E. W. Horlebein will attend both conferences. The three-day conference sponsored by the Birmingham District Chapter—to be held at the Tutwiler Hotel, Birmingham, Ala.,—includes five technical sessions, a luncheon, the conference banquet with Dr. Ralph B. Draughon, president, Alabama Polytechnic Institute (Auburn) as speaker, and a day and a half of plant visitations.

Program chairman is Chapter Vice-Chairman Morris L. Hawkins, Stockham Valves & Fittings, Inc., Birmingham, with Joe T. Gilbert of the same company assisting. Edgar A. Brandler, Electro Metallurgical Div., Union Carbide & Carbon Corp., is entertainment chairman. Conference secretary-treasurer is Fred K. Brown, Adams, Rowe & Norman, Inc., who holds the same office in the chapter. J. P. McClendon, Stockham Valves & Fittings, is in charge of publicity.

The Wisconsin Regional Foundry Conference consists of 24 technical meetings, two luncheon meetings, and a banquet at which Wisconsin Governor Oscar Rennebohm will speak, all to be held at Hotel Schroeder, Milwaukee. The Wisconsin regional—sponsored jointly by the Wisconsin Chapter and the University of Wisconsin—now in its thirteenth year, is under the chairmanship of Walter W. Edens, Badger Brass & Aluminum Foundry Co., Milwaukee, vice-president of the chapter. Co-chairman is the chapter secretary, George E. Tisdale, Zenith Foundry Co. Associate chairmen are Prof. E. R. Shorey and George J. Barker, University of Wisconsin. J. G. Risney, Risney Foundry Equipment Co., a chapter director, is program chairman.

WISCONSIN REGIONAL CONFERENCE

Advance registration for the Wisconsin Regional Foundry Conference—$10.00 for the full conference—can be made through Leon H. Decker, Foundry Div., Allis-Chalmers Mfg. Co., West Allis 14, Wis. chapter treasurer. Preview of the program shows the following sessions:

Thursday, February 9

9:00 a.m.—Registration.

10:00 a.m.—Opening Session. Speakers: Dean M. O. Withey, College of Engineering, University of Wisconsin, and A.F.S. President E. W. Horlebein.

12:00 noon—Luncheon. Speaker: Kenneth Haagensen, director of public relations, Allis-Chalmers Mfg. Co.

2:00-3:30 p.m.—Sectional Meetings.

Steel—"*Routing of Castings Through the Cleaning Room,*" Lester B. Knight, Lester B. Knight & Associates, Chicago.

Gray Iron—"*Slight Variables Affect Sand Properties,*" N. J. Dunbeck, Eastern Clay Products, Inc., Jackson, Ohio.

Malleable—"*Progress Through Motion Study and Better Methods,*" E. Braun and S. D. Martin, Central Foundry Div., General Motors Corp.

Non-Ferrous—"*Precision Aluminum Castings,*" Hiram Brown, Solar Aircraft Corp., Des Moines, Iowa.

Pattern—"*Gating of Gray Iron Castings,*" D. T. Dobson, General Malleable Corp., Waukesha, Wis.

Technical—"*Spectrophotometer,*" C. D. Coleman.

3:40-5:10 p.m.—Sectional Meetings.

Steel—"*Mold Cavity Gas Formation as Related to Steel Castings,*" Charles Locke, Armour Research Foundation, Chicago.

Gray Iron—"*New Evaluation of Casting Processes by Navy Research,*" H. H. Harris, project director, U. S. Navy Research.

Malleable—"*Getting the Most Out of Your Molding Machines,*" W. W. Eichenberger, Milwaukee Foundry Equipment Div., Spo, Inc., Milwaukee.

Non-Ferrous—"*Some Bronze Problem Castings,*" R. A. Colton, Federated Metals Div., American Smelting & Refining Co., Barber, N. J.

Pattern—"*Pressure Cast Aluminum Patterns and Core Boxes,*" J. Mathias, Accurate Match Plate Co., Chicago.

Technical—"*Zirconium Sands,*" speaker to be announced.

6:30 p.m.—Banquet. Speaker: The Hon. Oscar Rennebohm, governor, State of Wisconsin.

Friday, February 10

10:00-11:50 a.m.—Sectional Meetings.

Steel—"*Gating Practices,*" Fred B. Riggan, Key Co., East St. Louis, Ill.

Gray Iron—"*The Cupola, Its Raw Material, and Its Operation,*" B. P. Mulcahy, Fuel Research Laboratory Inc., Indianapolis.

Malleable—"*Foundry Mechanization for a Job Shop,*" P. C. DeBruyne, Moline Malleable Iron Co., St. Charles, Ill.

Non-Ferrous—"*Cleaning Room Practices,*" H. F. Younger, Chicago Faucet Co., Chicago.

Pattern—"*Modern Pattern and Foundry Supplies,*" speaker to be announced.

Technical—"*Gases Used in Metallurgical Processes,*" speaker to be announced.

12:00 noon—Luncheon. "*So You Think You Are Slipping,*" E. A. McFaul, Midwest Institute, Chicago.

2:30-4:00 p.m.—Sectional Meetings.

Steel—"*Product Development,*" Wm. J. Phillips, Steel Founders' Society, Cleveland.

Gray Iron—"*Discussion of Stress Analysis Problems,*" speaker to be announced.

Malleable—"*Simple Metallurgy of Malleable Iron,*" L. R. Friedman, National Malleable & Steel Castings Co., Cicero, Ill.

Non-Ferrous—"*Information Forum,*" Eugene W. Smith, Western Materials Co., Chicago; John Buduik, Wisconsin Aluminum Foundry Co.; Walter W. Edens, Badger Brass & Aluminum Foundry Co.; Tom Kramer, Wm. F. Jobbins, Inc., and M. E. Nevins, Wisconsin Centrifugal Casting Co.

Pattern—"*National Pattern Program,*" L. E. Tucker, City Pattern & Foundry Co., South Bend, Ind.

Technical—"*Permanent Molds,*" F. C. Hoenicke, Foundry Div., Eaton Mfg. Co., Vassar, Mich.

BIRMINGHAM REGIONAL CONFERENCE

Program for the 18th Birmingham Regional Foundry Conference follows. All day Saturday, February 4, is available for plant visitation.

Thursday, February 2

10:00 a.m.—Registration.

11:00 a.m.—Opening Session. "*A Foundrymen's Trip to Europe,*" A. W. Gregg, Whiting Corp., Harvey, Ill.

12:30 p.m.—Luncheon. Speakers: National President E. W. Horlebein, and Secretary-Treasurer Wm. W. Maloney.

2:30 p.m.—"*Cupola Operation,*" Lyle L. Clark, Buick Motor Div., General Motors Corp., Flint, Mich.

4:00 p.m.—"*Sand Control,*" Harry W. Dietert, Harry W. Dietert Co., Detroit.

Friday, February 3

9:00 a.m.—Plant Visitations.

2:30 p.m.—"*Cores,*" O. J. Myers, Werner G. Smith Co., Minneapolis.

4:00 p.m.—"*The FEF Program at Alabama,*" George K. Dreher, Foundry Educational Foundation, Cleveland, and Prof. E. C. Wright, University of Alabama.

7:00 p.m.—Banquet. Speaker: Dr. Ralph B. Draughon, president, Alabama Polytechnic Institute (Auburn).

Walton L. Woody

NOMINATES

W. L. Seelbach

1950-51 OFFICERS AND DIRECTORS

NOMINATED PRESIDENT of the American Foundrymen's Society for 1950-51 is Walton L. Woody, National Malleable & Steel Castings Co., Cleveland, 1949-50 National Vice-President. Nominated as A.F.S. National Vice-President for 1950-51 at a meeting of the A.F.S. Nominating Committee December 9 is Walter L. Seelbach, president and general manager, Superior Foundry, Inc., Cleveland.

A.F.S. Director nominees to serve three-year terms beginning in 1950 are:

J. J. McFadyen, general manager, Galt Malleable Iron Co., Galt, Ont., Canada.

J. O. Ostergren, president, Lakey Foundry & Machine Co., Muskegon, Mich.

Frank W. Shipley, foundry manager, Caterpillar Tractor Co., Peoria, Ill.

James Thomson, chief engineer, Continental Foundry & Machine Co., East Chicago, Ind.

E. C. Troy, foundry engineer, National Engineering Co., Philadelphia.

E. W. Horlebein, Gibson & Kirk Co., Baltimore, whose term as A.F.S. National President expires in 1950, will continue as a Director of the Society for a year.

Election of officers and directors will take place during the Annual Business Meeting of the Society at the A.F.S. Foundry Congress and Show, to be held in Cleveland, May 8-12. New A.F.S. officials will take office immediately following the annual meeting of the Board of Directors next July.

Directors who will complete their terms in July are:

E. N. Delahunt, general superintendent, Warden-King, Ltd., Montreal, Que., Canada.

W. J. MacNeill, assistant to the president, Dayton Malleable Iron Co., Dayton, Ohio.

John M. Robb, Jr., resident manager, Hickman, Williams & Co., Inc., Philadelphia.

A. C. Ziebell, president and general manager, Universal Foundry Co., Oshkosh, Wis.

Frank C. Riecks, foundry manager, Ford Motor Co., Dearborn, Mich.

Nominations for officers and directors of A.F.S. for election at the 1950 Annual Business Meeting are announced in accordance with the By-Laws which require that the report of the Nominating Committee be published at least 60 days prior to the Meeting. Thereafter and at any time 45 days prior to the date of the Annual Business Meeting additional nominations may be made by written petition filed with the secretary of the Society and signed by 35 members in good standing.

Should no candidates be nominated by petition, the secretary "*shall, at the annual Business Meeting, cast*

James Thomson

J. J. McFadyen

J. O. Ostergren

E. W. Horlebein

the unanimous ballot of all members for the election of the candidates named in the report of the Nominating Committee, and as published to the membership" as prescribed by the By-Laws. If additional candidates are nominated by petition, the By-Laws require that elections shall be by letter ballot.

The seven members of the Nominating Committee, in addition to the two Immediate Past Presidents of the Society, are chosen by the Executive Committee of the Board of Directors from lists of candidates submitted by the various eligible chapters. One member of the Nominating Committee may be from the list of members in the United States, Canada and Mexico not residing in a chapter area. A chapter is not eligible to have a member on the committee if represented during the previous two years. Two candidates for the Nominating Committee are submitted to the National President of A.F.S. prior to July 1 of each year by the eligible chapter.

Announcement of this year's Nominating Committee was made in the November, 1949, issue of American Foundryman in accordance with the By-Laws, which require that such announcement be made not later than November 15 of each year.

All nominees have been active in the foundry industry and prominent in activities of the Society for many years. Biographical sketches and pictures of new officers and directors will appear in the May issue of AMERICAN FOUNDRYMAN following election.

Continuing members of the A.F.S. Board of Directors whose terms expire in 1951 are:

T. H. Benners, Jr., T. H. Benners & Co., Birmingham, Ala.

N. J. Dunbeck, vice-president, Eastern Clay Products, Inc., Jackson, Ohio.

Robert Gregg, foundry manager, Reliance Regulator Corp., Alhambra, Calif.

A. M. Fulton, vice-president, Northern Malleable Iron Co., St. Paul, Minn.

V. E. Zang, vice-president, research and development, Unitcast Corp., Toledo, Ohio.

Those whose terms expire in 1952 are:

T. E. Eagan, chief metallurgist, Cooper-Bessemer Corp., Grove City, Pa.

L. C. Farquhar, Sr., works manager, American Steel Foundries, East St. Louis, Ill.

V. J. Sedlon, president, Master Pattern Co., Cleveland, Ohio.

F. G. Sefing, research metallurgist, International Nickel Co., New York.

L. D. Wright, plant manager, U. S. Radiator Co., Geneva, N. Y.

F. W. Shipley

E. C. Troy

PLAN BROAD SAFETY AND HYGIENE PROGRAM

SAFETY AND HYGIENE operations of A.F.S., re-activated since the end of the war, were developed further December 9, when Safety and Hygiene Committee members met in Chicago to discuss recommended practices and to lay plans for a long-range program. Lee C. Wilson, Society president in 1943-44 and chairman of the committee, presided.

A general discussion of existing and new recommended practices, performance vs. engineering codes, air pollution, and a series of proposals prepared by Dudley A. Irwin, Aluminum Co. of America, Pittsburgh, led to preparation of a long-range program for submission to the A.F.S. Board of Directors.

The proposal recommends continuous revision of existing recommended good safety and hygiene practices to keep them in conformance with new developments and suggests the following subjects be considered for preparation as new recommended practices: woodworking, exhaust systems for electric melting furnaces, welding, acoustical treatment of work areas to minimize noise, control of external air pollution, ventilation requirements for sand handling systems and shake-outs, for nonferrous melting furnaces, and for the general working area.

An energetic educational program to make foundrymen conscious of safety and hygiene is being suggested.

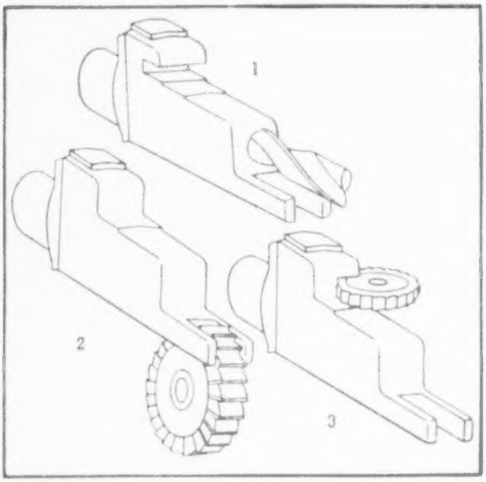
Attending the December 9 meeting, in addition to Chairman Wilson, was the entire membership of Safety and Hygiene Committee, Secretary-Treasurer Wm. W. Maloney, Technical Director S. C. Massari, and a number of industry representatives who came at the instigation of A.F.S. Vice-President Walton L. Woody, National Malleable & Steel Castings Co., Cleveland.

Industry representatives were Jas. R. Allan, International Harvester Co., Chicago, long chairman of the committee; Harry Moore, Ford Motor Co., Dearborn, Mich.; Frank A. Patty, General Motors Corp., Saginaw, Mich.; James A. Purdy, Michigan Mutual Liability Co., Detroit; J. C. Radcliffe, Ford Motor Co.; and E. J. Walsh, American Steel Foundries, Chicago.

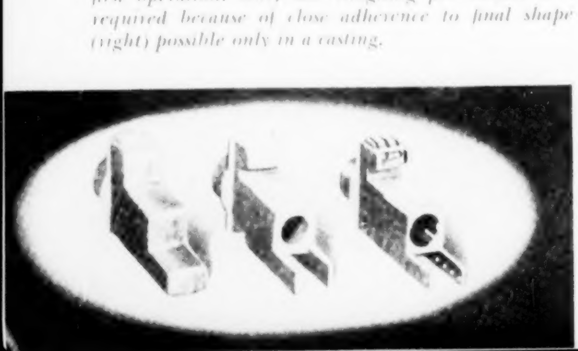
Committee members are: Fred C. Fluegge, International Harvester Co., T. J. Glaza, Crane Co., A. G. Granath, National Engineering Co., C. C. Sohl, American Steel Foundries, and H. J. Weber, American Brake Shoe Co., all of Chicago; Dr. Irwin of Aluminum Co.; John M. Kane, American Air Filter Co., Louisville, Ky.; E. H. King, Hill & Griffith Co., Cincinnati; R. H. Mooney, General Motors Corp., Saginaw, Mich.; and W. O. Vedder, Pangborn Corporation.

CASTINGS CAN DO IT BETTER!

Bruce L. Simpson
President
National Engineering Co.
Chicago



One example of an instance wherein a casting has replaced a forged machine part, effecting a 35 per cent reduction in machining time and a substantial reduction in net cost is illustrated in the diagram above and the photograph below. (Above) Forged trunnion blocks weighed 20 lb when finished and required (1) drilling and reaming of hole, (2) roughing and finish milling of parallel mounting legs, and (3) rough milling of clearance cut above center of block. In all, 11 lb of metal were lost. Unfinished casting (below, left) weighed only 9.9 lb. Hole was cored out (center), permitting facing and boring at first operation. Only one roughing per surface was required because of close adherence to final shape (right) possible only in a casting.



CREATIVE SELLING is the key to the future prosperity of the foundry industry. Without creative salesmanship to establish a constantly expanding market for castings, all of the foundryman's technical knowledge, efforts and modern equipment are to little avail—inroads into the castings market will inevitably be made one-by-one by products that are welded, forged or fabricated.

Creative selling calls for analysis of every metal product by the foundryman with the object of redesigning it or developing a technique or alloy for producing it as a casting. In this work—preferably done in close cooperation with the customer to improve his product—emphasis should be placed on the process rather than the material. All foundries should be interested for when a steel foundry loses a customer to a forge shop, it hurts all foundrymen. When a gray iron casting loses to a weldment, the entire foundry industry is affected. When a non-ferrous casting is replaced by a fabrication, it means that the consumer has somehow come to believe that there is a better method of making his metal parts than by casting.

Competitive Methods Challenge Leadership

Foundries for centuries led the world in production of metal parts for industry, commerce, and agriculture. This centuries-long leadership has caused the foundryman of today to adopt an attitude of satisfaction with his ability to produce if the customer will only come to him for castings. He has let his technical ability far outstrip his ability to create demand for castings. He forgets that science in centuries past produced few competitive metal fabricating methods but that within recent years modern technology has come up with new means of producing metal parts—techniques that today seem to be challenging the leadership of the castings industry in many fields.

Castings have many decided advantages over other means of metal fabrication. Their metal content can be varied to meet individual needs as easily as a cook adds salt to a stew. That basic element of the casting process is used as a sales factor too infrequently.

Does anyone stress the ability of the foundry to create any form desired by the customer? Here is

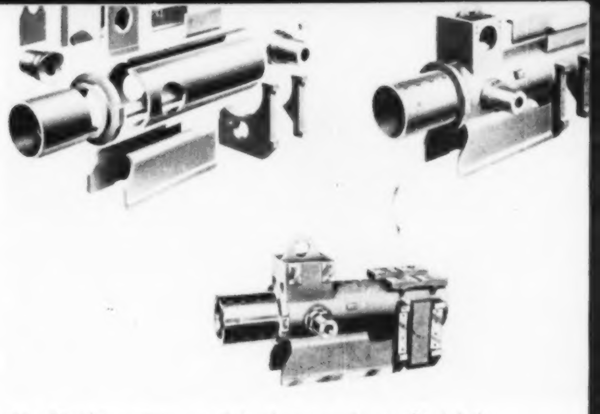
This article is based on a talk presented by the author recently before a meeting of the Malleable Founders Society.

a vital factor in manufacturing products to fit the infinite variety of shapes and sizes required by today's industry. The foundry industry is able to make thousands of identical parts . . . repetitively . . . easily . . . by the shortest route from raw-material to finished product—the casting process.

The basic ingredient of the success of any foundry lies not in that its castings are of steel, or of gray iron or non-ferrous metals—but in that its product is a casting—one of the most basic of man's achievements.

On these pages are illustrations of castings that have not only replaced other methods of metal fabrication but in so doing have affected economies in many phases of production. Regardless of metal composition, all have one common denominator—fluid metal poured into a mold.

Shown here are but a few of hundreds of instances wherein castings have increased the ultimate profit of the buyer of metal products—first, by making his product more efficient and thus worth more than a similar product made by welding or forging—and second, by producing parts at a lower cost.



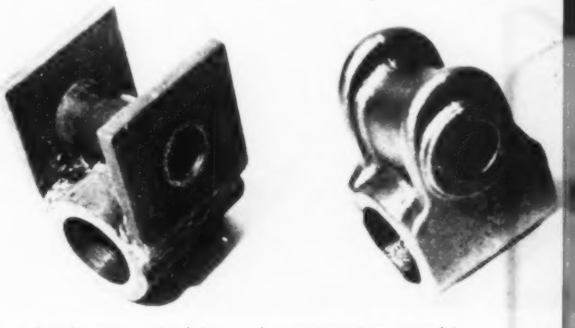
The 20 pieces shown at left above made up the fabricated anti-aircraft gun mount slide (right), which was replaced by the single casting shown below it.

Castings Have Many Advantages

Castings possess a number of specific advantages over competitive methods. There is the possibility of reduction in cost to the buyer. This is possible because of the low metal wastage of the casting process, wherein excess metal can be remelted and converted to useful castings in a single cycle of operations. Weldments, on the other hand, require that each component be cut and trimmed to size, necessitating far more wastage of metal which cannot be re-used in the welding shop without going through the lengthy steelmaking and rolling operations.

The many pieces that make up the finished weldment require extensive assembly work and the chance for error is far greater than in a part which is often cast in one-piece or at best needs few components.

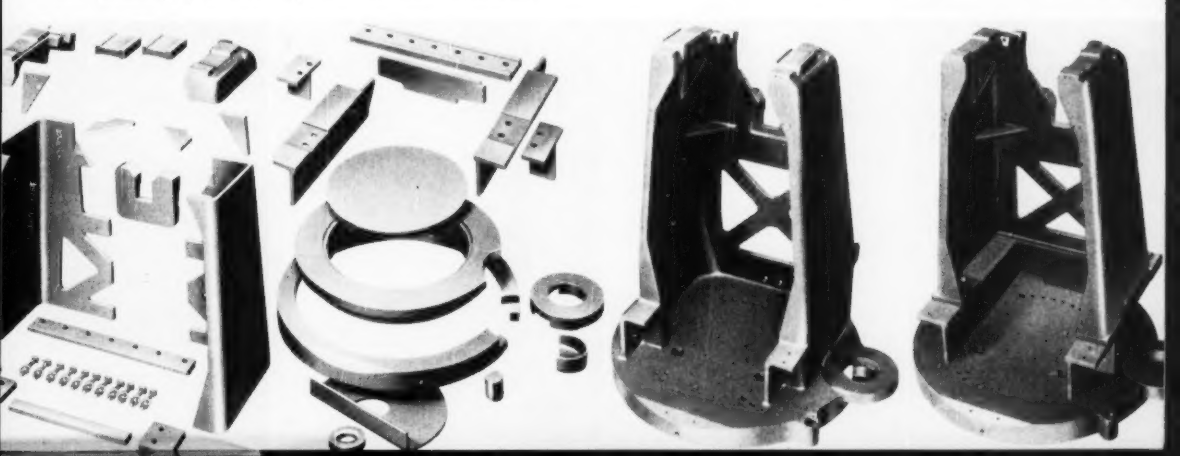
Holes can be cored in castings, eliminating punch-

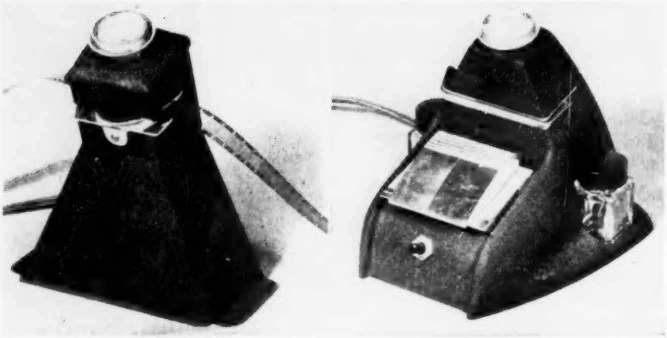


Farm implement swivel formerly produced as a weldment (left) was produced at one-third less cost as a smooth, streamlined integrated casting (right).

(Below) Cast washing machine latches replaced forgings because of need for superior resistance to corrosion.

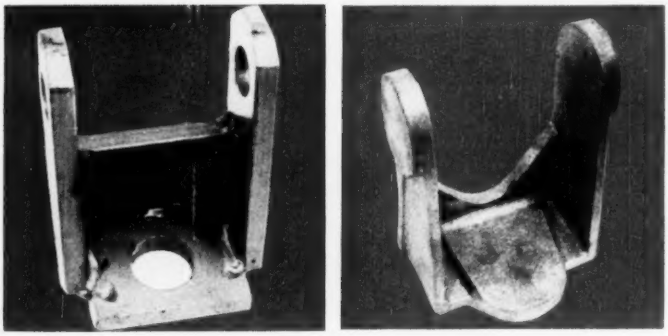
Fabrication of an anti-aircraft gun mount carriage and base ring required 26 pieces for the carriage (below left) and 14 individual parts for the base ring (second left). Finished weldment (third left), with its 40 pieces, was replaced by a single casting (right), eliminating high metal wastage and cutting and finishing processes required for the weldment.





The fabricated film viewer (left) cost more to produce than the cast film viewer at right because patterns for the casting were made at a fraction of the cost of dies and fixtures for the fabricated viewer. In this case the piece was in experimental production and pattern cost could be governed accordingly. No such flexibility is permitted metal fabricators, whose jigs must be made the same for one or 1000 pieces.

This disc harrow hinge part was converted from a weldment (left) to a casting (right) at a substantial savings in production costs and a reduction in finished weight from 5½ to 3½ lb, effecting freight savings and materially reducing the manufacturer's delivered price.

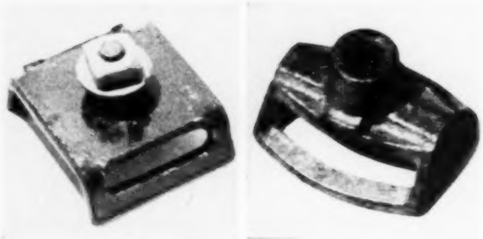


ing and requiring little or no finishing. Castings require no riveting. Tool expense is generally much less than for forgings. Casting patterns often can be made more cheaply than forging dies and jigs. Contrary to opinion, the reduction in weight of a part frequently possible in changing to a casting from a weldment often affords the customer savings in freight.

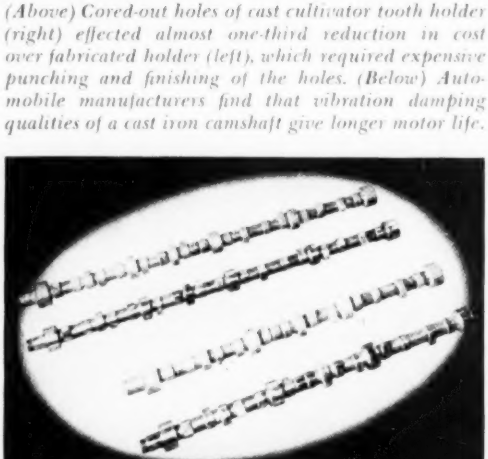
Castings provide many product improvements over weldments—appearance is usually better; one-piece castings that often replace welded assembles offer the reliability that comes with an integrated machine part; castings can be alloyed to meet the most exacting customer requirements and to combat corrosive atmospheres, hard wear and other special conditions; and it has been found that both cast iron and certain cast alloy steels contain inherent vibration damping properties that are valuable in engine construction.

To create new fields and new demands for castings the author believes there should be a central investigative body representing all foundrymen to develop new casting business without regard to metal composition. Let the investigators examine metal products not now cast to determine which *can* be cast, which *might* be, and which *can't* be cast until a foundry technique is developed especially for them. The group could list the manufacturers of such products, give all foundrymen the suggested new designs and techniques, and let them produce castings that will do a better job more economically.

Simultaneously cast products ought to be advertised nationally—with education groups, with designers, and with the public—so all will know and believe that castings can do it *better!*



(Above) Cored-out holes of cast cultivator tooth holder (right) effected almost one-third reduction in cost over fabricated holder (left), which required expensive punching and finishing of the holes. (Below) Automobile manufacturers find that vibration damping qualities of a cast iron camshaft give longer motor life.



Let's Pretend—

E. F. Chittenden
Director of Industrial Relations
Unitcast Corp.
Toledo, Ohio

no one made you wear safety glasses— now you're BLIND!

I lay in a hospital bed, my head swathed in bandages, not knowing if I would ever see again. What in the world could I do now to support my wife and children? What was to become of them? Of me? My comfortable old habits of living were torn away—the very pattern of my existence destroyed in an instant by an accident that could have been easily avoided. When the first flood of horror and fear ebbed, there came deep resentment against the men who had condemned me to a world of eternal midnight. Management, the superintendent, the foreman—I felt they were responsible for my accident. Why didn't they *make* me wear eye protection?

YET I WAS ONE OF THE LUCKY ONES. In time I regained the use of my eyes—but not before I experienced the bewilderment, despair and deep sense of loss that only the blind can know. It was an experience that I can never forget, one that awakened in me a desire to do something for those who had never known or who had lost the priceless gift of sight.

I went to a school where guide dogs for the blind are trained and became an instructor. I voluntarily "went blind" by having my eyes blindfolded and lived as a blind person among the blind in order to help me understand the problems of training guide dogs for the sightless.

This experience eventually motivated the industrial safety program, "*Let's Pretend*," on which I have collaborated with George Zang, director of safety for the Unitcast Corp. As a young man, Mr. Zang had several years' experience in the theater and he was quick to recognize the value of dramatizing my experiences as a "blind" man as an object lesson in industrial safety.

Mr. Zang and I decided, a little over two years ago, that our company's safety program needed revision and a "shot-in-the-arm." We visited each of the company's three steel foundries, talking with employees to find out why our programs weren't getting across to the man on the job.

With management we went into the subjects of employee turnover, industrial relations, and production

Simulating blindness with a blindfold during "Let's Pretend" session, worker tries to light a cigarette.

problems. We examined safety plans used by other organizations and their relative values in making men on the job safety-minded. We were especially concerned with the eye-accident rate among company employees.

Our company, we found, had the conventional long-range safety program for industrial plants—protective equipment, warning posters placed in conspicuous places, safety inspections and standards, and training for foremen and supervisors, with the expectation that they, in turn, would hold safety meetings with the employees. In short, we had an abstract proposition fed through a disconnected line of communication, one about as effectively received by the workers as a conversation over a broken telephone line.

We realized that *the worker must be made to want to protect himself.* If this sounds incongruous, look

into your plant for examples of carelessness in personal protection, or read in the daily papers incidents wherein the victim neglected to take simple, common-sense precautions. *Surveys reveal that 88 per cent of all industrial accidents are due to unsafe acts on the part of the worker.*

Basically, there is nothing new in safety—the fundamentals are the same as they have always been. Self-preservation is the first law of nature and safety is the first law of self-preservation. The desire for his own safety and the security of his family must be created in the worker through industrial psychology and planned educational programs.

We were convinced that we needed a new technique for presenting safety programs—one in which safety would be sold directly to the workers in down-to-earth programs dramatic enough to shock them out of the lethargic "it can't happen to me" attitude. Like merchants, who have learned that goods must be attractively packaged and displayed to catch the attention of the purchaser, Unitcast's top executives believed that safety programs must undergo the same treatment in order to hold the workers' attention.

New Type of Safety Demonstration

With this in mind, and with the enthusiastic support of management, Mr. Zang and I formulated a new type of safety program dealing with eye accidents, which records proved were by far the greatest number of plant accidents and were costing the company a great deal of money.

We began by writing a dramatic episode around my experience with blindness. I knew that if I could share that experience with each worker, the awful consequences of carelessness would be brought home to them in such a way that they would never again be unmindful of the precious gift of eyesight.

"Let's Pretend" had its beginning when 60 company foremen and supervisors were given a talk on safety, then served a meal in the plant cafeteria and told to eat it blindfolded. Food was arranged in a precise pattern on the plates and the men were told exactly where on the table to find knives, forks, spoons, salt, pepper, coffee cups, etc. While they ate I described *"A Day in the Life of a Totally Blind Person."*

There was no comment when the session was over, and we began to feel that our demonstration had fallen flat. Within 48 hours we discovered that foremen and supervisors who had never worn eye protection were applying to the first aid department for spectacles and were telling employees about their experiences in the safety meeting. Within a few days the company's entire stock of goggles and spectacles, which had hitherto moved slowly, was gone and more were ordered.

Participants Simulate Blindness

The experiment is now a vital part of Unitcast's training program and has been rewritten several times during the last two years to better highlight the helplessness of the newly-blind.

Opening the *"Let's Pretend"* program, Mr. Zang gives a general talk on safety, gradually narrowing it down to eye protection, then instructs participants to open sealed envelopes which have been placed before them. The envelopes contain a mask, a strip of braille, a cigarette and packet of matches, and a toothbrush and small can of tooth powder.

Following instructions, participants put on the masks and adjust them so that they are in total darkness, then perform such functions as lighting a cigarette, pouring tooth powder onto a brush, and pouring water into a glass. Simple enough for those who can see, but complicated and difficult for those who are sightless.

"Let's Pretend" is not by any means the sum of Unitcast's safety program. It is part of a plan by which workers are taught to think constantly of their own safety and the welfare of their families. Set rules for

Even everyday routines are difficult for the blind. These blindfolded men are trying to pour water into a glass during a safety session. Finger is inserted into glass to gage water level, prevent spilling.

Blindfolded workers attempting to pour toothpowder onto brush during "Let's Pretend" meeting. Trick is to place thumb and index finger on either side of bristles, forming a trough to minimize spilling.

safety and penalties for violation of rules have been abolished and the whole plan is voluntarily undertaken by the workers.

Each foreman was asked to canvass his department for volunteers to attend the first safety training conference. Response on the part of employees was practically unanimous and 80 were selected to represent the various departments. These employees were termed "conferees" and the conference was set to run one hour per week for 12 weeks. The group of 80 was broken down into four subgroups of 20 employees each for easier handling.

Workers Help Solve Problems

During the conference, workers participated in solving safety problems, and made suggestions regarding elimination of accident hazards. These suggestions in turn were presented to the management. Most were acted upon, since they were simple and inexpensive solutions to hazards which had been overlooked by foremen and safety men who were "too close to the trees to see the woods."

These practical, constructive programs not only taught each "conferee" to be safety-minded, they gave the worker the feeling that he was a part of a plant-wide safety effort. Those who completed the required number of sessions attended a graduation exercise and dinner, were commended by the management and given badges denoting that they were safety monitors in their respective departments.

Today we find that these safety monitors spread the gospel among the workers and their suggestions are more readily accepted by their fellow employees than they would be from foremen or "white collar bosses."

When one or more employees of a department have completed the course, others are enrolled in the conferences, which are continuous. In time, every employee of Unitcast's three foundries will have completed the training course and will have extensive knowledge about accident prevention practices.

As a follow-up to the course, the medical department sends reports of even the slightest injury requiring first aid to the director of safety, who in turn delegates one of the department safety monitors to contact the injured employee, discuss and investigate the cause of the injury and suggest corrections to avoid recurrence of the accident. The safety monitor may even suggest that the injured employee enroll for the next safety training conference.

Results of the program have been gratifying. After the first training conference, in 1948, the accident frequency rate dropped from 48.64 per cent to 13.45 per cent, and as this article is written, one of the foundries has operated 230 days without a lost-time accident, and has received plaques from the Steel Founders' Society of America and the National Safety Council. Eye-accidents have been reduced from 115-125 per month to about 1-9 per month and none is of major importance.

Core Practice Book Available Soon

Core room practice has been brought up to date in Foundry Core Practice, second edition of Modern Core Practices and Theories, to be available the first of February. The thorough revision of the original book, published by A.F.S. in 1942, was made by its author, Harry W. Dietert, Harry W. Dietert Co., Detroit, with the cooperation of several members of Society technical committees. Assisting with the revision were H. Ries, chairman, Sand Division; Elmer C. Zirzow, John Deere & Co., Moline, Ill.; J. A. Rassenfoss, American Steel Foundries, East Chicago, Ind.; and H. M. St. John, Crane Co., Chicago.

Foundry Core Practice brings together in a single publication the best current information on every phase of core production, use, equipment, mixtures, sand, binders, etc., in addition to much valuable material not published elsewhere. Containing well over 500 pages, the new edition includes more than 300 illustrations, and an extensive bibliography.

Foundrymen who placed the several hundred recent orders for the earlier edition—out of print for some time—are receiving letters requesting instructions regarding filling the orders by means of the new volume.

BASIC EQUIPMENT FOR FOUNDRY CHEMICAL LABORATORIES

Most castings are bought today on the basis of rigid specifications. The customer makes these specifications to insure procurement of castings that will serve the purpose for which they were designed. One customer may require an iron for wear resistance; another a certain strength that cannot be met without alloying. Usually the specifications are stated in terms of one or all of the following: chemical composition; physical properties; microstructure. The more items included in a specification the less flexible it becomes, i.e., if two of the items are designated the third can be left to the discretion of the foundryman.

As an example, the physical properties and the microstructure might be specified, and the chemical composition may be decided at the foundry. Such an arrangement permits more foundries to cast a part because it allows a greater range of foundry practices. As the specifications are made more rigid, fewer foundries can meet them, because many foundries do not possess sufficient controls for flexibility of operation.

In recognition of the trend toward more rigid specifications for foundry products, the A.F.S. Cupola Research Committee has compiled lists of equipment and chemicals necessary to establish laboratories for closer control of the foundry processes. This article is the eighth in a series prepared by the Committee for publication in the *American Foundryman*.

Some foundrymen believe that they have achieved control when they send out two or three samples for chemical analysis. Yet, control is not based on spot checks but on continuous and systematic checking. It is only the latter procedure that can show the trend of an operation and permit operators to make corrections.

Instruments required for control work must be suitable for analyzing the material, and must give reproducible results. To further insure accuracy it is customary to check the instruments frequently against standards. The equipment and chemicals required for chemical control will be considered first as it is believed that this control can do the most to regulate the metal processed through the foundry. In the chemical

Chemicals Required

(C.P. or ACS grade)

acid, boric, H_3BO_3	1 lb
acid, hydrochloric, HCl	case 10 x 6 lb
acid, hydrofluoric, HF	1 lb
acid, nitric, HNO_3	case 10 x 7 lb
acid, oxalic, $H_2C_2O_4 \cdot 2H_2O$	2 lb
acid, perchloric, $HClO_4$, 60%	3 bottles @ 5 lb
acid, phosphoric, H_3PO_4 90%	3 bottles @ 7 lb
acid, sulphuric, H_2SO_4, 95.5-97%	case 10 x 9 lb
acid, tartaric, $H_2C_4H_4O_6$	2 lb
ammonium carbonate, $(NH_4)_2CO_3$	5 lb
ammonium chloride, NH_4Cl	5 lb
ammonium diphosphate, $(NH_4)_2HPO_4$	2 lb
ammonium hydroxide, NH_4OH	case 10 x 4 lb
ammonium molybdate, $(NH_4)_2MoO_4$	2 lb
ammonium persulphate, $(NH_4)_2S_2O_8$	2 lb
ascarite	2 lb
alpha benzoinoxime	
bromine	1/4 lb
calcium chloride (technical)	5 lb
cupferron	
dimethylglyoxime	1/4 lb
dualaccelerator copper strip	
ethyl alcohol (95% pure grain)	5 gal
ethyl ether $(C_2H_5)_2O$	3 lb
ferrous ammonium sulphate: $FeSO_4 \cdot (NH_4)_2SO_4 \cdot 6H_2O$	2 lb
ferrous sulphate, $FeSO_4$	5 lb
manganese sulphate, $MnSO_4$	2 lb
methyl orange	2 oz
methyl red	2 oz
phenolphthalein	1/4 oz
potassium chlorate, $KClO_3$	3 lb
potassium ferricyanide, $K_3Fe(CN)_6$	3 lb
potassium hydroxide, KOH, pellets	5 lb
potassium iodate, KIO_3	1 lb
potassium iodide, KI	2 lb
potassium nitrate, KNO_3	1 lb
potassium permanganate, $KMnO_4$	2 lb
sodium arsenite Na_2HAsO_3	1 lb
silver nitrate $AgNO_3$	2 lb
sodium hydroxide, NaOH, pellets	5 lb
sodium sulphite, Na_2SO_3	1 lb
sodium thiosulphate, $(Na)_2S_2O_3$	2 lb
starch (arrowroot)	1/2 lb
tin, 20 mesh	5 lb
urea, $(NH_2)_2CO$	2 lb
vaseline (petroleum jelly)	
wetting agent (aerosol)	
zinc oxide, ZnO	1 lb
zinc sulphate, $ZnSO_4$	1 lb

Chemical Laboratory Equipment

Laboratory Furniture

Center table, wood, 12x54x37 in., with reagent shelf, drain trough in middle and soapstone sink with two drain boards at end.
Fume hood, sash front, 72x31x104 in., with fan, sink and outlets.
Utility table, open frame.
Shelving.
Desk and chair.

Laboratory Balances

Balance, analytical, capacity 200 gr., sensitivity 1/20 mg.
Balance weights, class S, rhodium plated.
Balance light.
Balance cover.
Balance damping device.
Balance pans, watch glass.
Balance rests 4
Trip scale, capacity 2 kilos.
Metric balance weights for use with trip scale.

Carbon Determination Equipment

Two-minute carbon determinator
Combustion furnace
Combustion tubes 3
Combustion boats 1000
Liner shields 6
Boat pusher.
Oxygen tank regulator.
Calcium chloride drying jars 2
Fleming type purifying jar.
Heat deflectors 2
Barometer.
Cast metal specimen mold.
Mortar and pestle (hardened steel).

Glassware

Beakers, 150 cc. 20
Beakers, 250 cc. 20
Beakers, 400 cc. 20
Beakers, 600 cc. 20
Beakers, 1000 cc. 2
Bottles, Reagent, 500 cc dil. and con. H_2SO_4, dil. and con. HCl, dil. and con. HNO_3, NH_4OH.
Bottles, narrow mouth storage, 5 gal. 2
Bottles, wicker necked wash, 500 cc. 2
Burettes, side filling, straight stopcock, 50 cc. 2
Casseroles, 300 ml. 6
Graduates, 50 cc. 3
Graduates, 100 cc. 2
Graduates, 250 cc. 1
Graduates, 500 cc. 1
Graduates, 1000 cc. 1
Thermometers, partial immersion, centigrade scale −5 to 200 2
Desiccator, plain form interchangeable covers, inside dia. 250 mm. 1
Desiccator, plate, 230 mm. porcelain 1
Flasks, Erlenmeyer, 300 cc. 24
Flasks, Erlenmeyer, 500 cc. 12
Flask, suction filter, 500 cc. 3
Flasks, sulphur distilling, 500 cc. 3
Funnels, powder, 65 mm. 2
Funnels, long stem, fluted, pyrex, 75 mm. 12
Funnels, ribbed glass short stem, 5¼ in. 2
Funnels, separatory, pyrex, 250 cc. 2
Funnel tubes, thistle top 3
Watch glasses, ribbed bottom, 3½ in. 12
Watch glasses, 100 mm 12

Miscellaneous

Brush, beaker 2
Brush, camel hair, ½ in. 2
Brush, counter 1
Brush, funnel 3
Burners, Meker 3
Clamps, burette, single 2
Clamps, double burette 1
Clamps 4
Combustion tube furnace 1
Crucibles, low form, fritted bottom, pyrex 6
Crucibles, porcelain, No. 0 50
Crucible covers, porcelain, No. 0 25
Crucibles, platinum, 15 cc (12 grs.) 2
Crucible holders 3
Water still, ½ gal per hr. 1
Distilled water storage tank 1
Filter paper, qualitative, 11 cm. .... 5 boxes
Filter paper, ashless, rapid filtering, 11 cm. .... 5 boxes
Filter paper tablets, ashless .... 1 box
Filter pumps, brass 2
Oven, drying, 17½x11x14 in., 1500 watt 1
Gas hot plate 1
Gauzes, wire 6
Marking tool 1
Spatulas 2
First aid kit 1
Flat disc ramrod 1
Rubber policemen 12
Stoppers, rubber, (determine later)
Stirring rods, glass, 250 mm 12
Support, funnel, 6 place 1
Tubing, glass (determine later)
Tubing, plastic
Tubing, rubber
Tripods, 9 in. high 6
Triangles, iron wire, pipe stem covered, size A 6
Tongs, beaker, asbestos covered 2
Tongs, crucible, nichrome 2

laboratory the incoming materials, the materials in process, and the final product can be analyzed only for chemical components.

The most widely accepted procedures for the analysis of metals are found in the ASTM *Methods of Chemical Analysis of Metals.* Coke analyses procedures are found in the ASTM *Standards on Coal and Coke,* while the procedures for the analysis of limestone are found in the ASTM *Supplement of Non-Metallic Materials of Construction.* Many foundry chemists, however, have pet procedures and timesavers such as the volumetric method for the determination of total carbon. It is not the intent of this paper to dwell on the merits of the various procedures, but rather to point out in general some of the factors involved in setting up a laboratory.

For best work a laboratory should be set apart from the foundry and off the beaten path. It should be located in a portion of the building that is reasonably free of vibration and as dust-free as possible, since grit plays havoc with instruments.

Furnishing the Laboratory

Laboratory benches come in many arrangements and because of unit design features they can be set up to meet most specific requirements. A double bench may be placed in the middle of the room or a single bench may be placed against the wall. The type of bench selected will depend upon the amount of work

to be carried on, since that determines the necessary bench area. Hoods should be provided with outlets arranged in a manner to permit of easy cleaning.

Sinks for laboratory use should be made of acid-resisting soapstone and provided with lead traps and pipes. It is best to have the plumbing arranged so that it is easily accessible.

Laboratory Balances

Since most laboratory measurements take the form of accurate weighings, an accurate analytical balance is advisable. A balance with a sensitivity of 1/20-milligram is desirable. To decrease weighing time magnetic dampers can be used. The use of class "S" weights is recommended. Laboratory balances are sensitive to vibration and should be placed in a portion of the laboratory that is free of it. To further insure the balance against vibration the weighing apparatus may be equipped with balance rests.

In the determination of total carbon the oxygen tank regulator, purifying towers, combustion furnace and accessories are common to all methods or procedures. The end product of this determination (CO_2) can be absorbed and weighed, or it can be measured volumetrically.

Several good volumetric type carbon determinators are on the market, and the type purchased is a matter of choice. Usually they are sold without the auxiliary equipment mentioned previously. These items, however, can be purchased from the firm selling the determinator or they can be obtained from other sources.

Sulphur can be determined volumetrically, using the auxilliary equipment mentioned in making the determination. The ASTM recommends a couple of evolution methods for sulphur determinations, and the equipment involved can be selected accordingly.

A cast metal specimen mold is recommended in preference to the drilling method. Reasons for this choice are indicated elsewhere.

The glassware purchased for the laboratory will depend upon the procedures used. The types and sizes can best be chosen by checking through the procedures to determine what is recommended. For most economical purchasing it is best to buy glassware in larger lots, say in quantities required for a 6-month period.

Water received in most laboratories contains too large a quantity of dissolved mineral salts to be used for analytical purposes. Thus, a water still and facilities for storage must be provided.

Methods Used Determine Equipment

A specific list of equipment has been prepared for an average foundry making gray iron castings (see page 11). It is assumed that:

1. Carbon will be determined by a volumetric method.
2. Silicon by the perchloric method, or the mixed acid method.
3. Manganese by the persulphate method.
4. Sulphur by the evolution method.
5. Phosphorus by the alkalimetric method.
6. Chromium by persulphate oxidation method.
7. Nickel by the gravimetric dimethylglyoxime method.
8. Molybdenum by the alpha-benzoinoxime method.
9. Vanadium by reduction with ferrous sulphate and titration with potassium permanganate method.

The convenience of having an iron analyzed for total carbon content in 20 min or for the silicon content in an hour cannot be overemphasized. Control, of course, is only achieved by frequent and regular testing. It is through such testing that a foundry can guarantee its customer a uniform casting.

Urge Prompt Release Of Apprentice Contest Patterns, Plan For Judging

Release of apprentice contest patterns immediately on completion of local and plant contests is urged by Prof. Roy W. Schroeder, University of Illinois, Navy Pier Branch, Chicago, chairman of the A.F.S. Apprentice Contest Committee, in order that remaining contestants will have an opportunity to use them. Failure of some participating companies in past contests to release patterns for early shipment to other contestants has resulted in disappointments due to entries arriving too late for judging.

Deadline date for closing of the contest is March 17. Sponsors of contestants are requested to indicate intention to participate as early as possible to facilitate routing of patterns. Competition is open in gray iron, steel, and non-ferrous molding, and in wood and metal patternmaking with cash prizes up to $100 in each of the five divisions. For details write to Jos. E. Foster, technical assistant, American Foundrymen's Society, 222 W. Adams St., Chicago 6, Ill.

Plans for judging moved another step forward with completion by F. W. Burgdorfer, Missouri Pattern Works, St. Louis, of templates and a layout on aluminum sheet to aid in judging the pattern entries. He had previously made the master patterns for the molding and metal pattern contests and finished the rough pattern castings for the molding divisions.

Eight A.F.S. chapters—Detroit, Wisconsin, Southern California, Northern Illinois-Southern Wisconsin, St. Louis District, Eastern Canada, Northern California, and Northeastern Ohio—have announced they are conducting local contests and a total of 16 companies are known to be holding in-plant contests.

Test For Sand In Metal Grindings

Foundry chemists interested in determining sand in brass or bronze—as in a study of scabbing and penetration, or analysis of metal grindings—can use a short method reported by Charles Goldberg, New England Smelting Co., West Springfield, Mass., in the J. T. Baker Chemical Co. *Chemist Analyst*.

Procedure recommended is to treat the sample in a large beaker with 20 ml of concentrated hydrochloric acid and 25 ml of 30 per cent hydrogen peroxide. After the initial strong action has subsided, the sides of the beaker are washed down with distilled water and the mixture is heated for a moment to ensure complete solution of all metallic particles. It is then immediately filtered, and the residue of silica is ignited and weighed.

NEW *AMERICAN FOUNDRYMAN* ABSTRACT SERVICE GIVES LEADS TO USEFUL FOUNDRY INFORMATION

ABSTRACTS OF WORLD-WIDE FOUNDRY LITERATURE start in this issue as the latest service of AMERICAN FOUNDRYMAN to members of the American Foundrymen's Society and other subscribers. Inclusion of abstracts in "The Foundrymen's *Own* Magazine" makes the most useful of foundry literature from all over the world available to readers with a minimum expenditure of time and effort. Information available only in foreign languages is briefed for follow-up where desirable.

Abstracts of current foundry literature broaden the regular services of AMERICAN FOUNDRYMAN devoted to saving time for busy readers while aquainting them with helpful information. Other such services are:

The Round Table—practical solutions to puzzling foundry problems prepared by specialists in the field.

Book Reviews—concise reviews of books interesting to foundrymen.

New Foundry Products—descriptions and illustrations of new foundry materials and equipment with more information available on request.

Foundry Literature—useful bulletins free on request and reviews of current foundry film releases.

Abstracts Tap Huge Library Resources

AMERICAN FOUNDRYMAN abstracts are prepared by The Research Information Service of The John Crerar Library, Chicago, recognized as the world's largest free public library devoted exclusively to science, technology, and medicine. The library has resources of nearly three quarters of a million volumes, and current subscriptions to thousands of technical periodicals.

Entire industrial research facilities of the library are available to foundries, foundry equipment manufacturers, and other firms in the metals field at charges covering only the actual cost of the service.

A special staff of research consultants, each with a Ph.D., or its equivalent, will undertake to do literature searches of Crerar Library's 700,000 books and/or the 15,000 technical journals and publications it receives regularly, on any subject. Included in this service are translations in any of the world's major languages, and the furnishing of abstracts, translations, and full reports on any subject.

Other facilities offered by Crerar's Research Information Service are desks, typewriters, and dictaphones for organizations desiring to send their own researchers to the library. The service will also make a literature search for the researcher and have all material ready for his study. The cost of either service is based upon the time and labor involved, plus a small percentage to cover overhead and supplies.

In some industries, five or six small companies have banded together to purchase a month-to-month investigation of literature in their field. Research Information Service also provides microfilm and photostat service. Details on Crerar's research services for industry are available by writing Kenneth H. Fagerhaugh, Research Librarian, The John Crerar Library, 86 East Randolph St., Chicago 1, Ill.

AMERICAN FOUNDRYMAN'S first abstracts by Crerar Library's Research Information Service follow.

Materials Handling

IMPROVEMENTS SAVE TIME. F. O. Lemmon, "Materials Handling in the Foundry," *Journal of Metals*, vol. 1, Nov. 1949, pp. 36-37.

The author discusses the improvements made in materials handling in his plant and gives the savings in time as compared to the old method. Some examples are, melting cycle for a 5-ton heat was reduced from 120 min to 88 min, a saving of 26 per cent. Manhours per melted ton were reduced from 2.20 to 1.78, a 19 per cent saving. To unload molding sand from a car required three or four men and anywhere from one-half to one day. With the installation of an underground belt conveyor and elevator system, a 70-ton hopper now requires only periodic supervision and can be emptied in two hours. The handling of scrap is now done by yard crane and magnet. An overhead belt conveyor delivers sand to any molding unit.

New Die Casting Process

SOLIDIFICATION UNDER PRESSURE. T. C. Du Mond, "New Casting Process Combines Features of Other Forming Methods," *Materials & Methods*, vol. 30, Nov. 1949, pp. 52-54.

A new casting method called the Bacco process produces parts reported to have the following characteristics: machining reduced approximately 60 per cent as compared to conventional castings; approximately 10 per cent higher mechanical properties; and tolerances around 0.002 in. In this process the metal is melted in a gas-fired furnace, then poured by ladle into a metal die. The die is heated to a temperature near that of the molten metal. Constant pressure is exerted on the die while the metal sets.

Molding Sand Binder

EFFECTS OF MIXING AND WATER. M. Stap, "Clay as a Binder in Molding Sand," *Metalen*, vol. 4, Oct. 1949, pp. 27-32 (in Dutch).

The phenomenon of the plasticity of clay is explained by a chemical interaction between the surface of clay and water. The mixing of the binder with sand and how an increase in water content affects the characteristics of the mixture are explained and shown diagrammatically. The greatest bonding strength (for the materials studied) is obtained when the sand-clay mixture contains 2½ per cent moisture. Two graphs show how the strength of bond and the plasticity vary with moisture content.

Die Casting Economics

PRODUCTION COST FACTORS. Eric James, *Light Metal Age*, vol. 7, Oct. 1949, pp. 8-11, 31-32.

The author presents several tables listing the various departments, classes of employees and equipment

(Continued on Page 95)

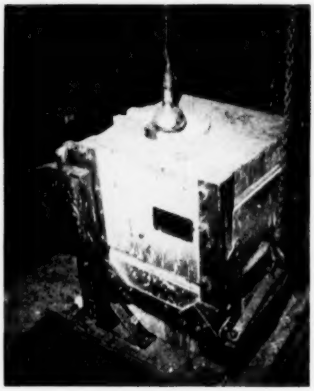
MODERN FOUNDRY METHODS...

CENTRIFUGAL CASTING OF WELDING RODS

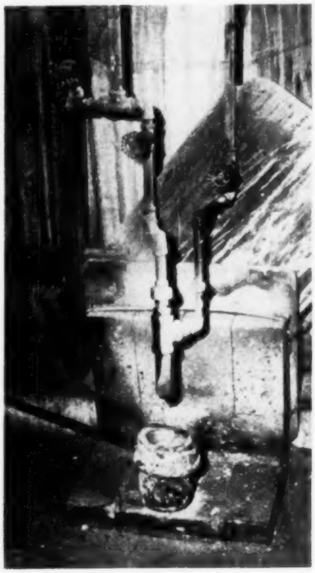
The major products of the Hughes Tool Co., Houston, Texas, are rotary drilling rock bits and core bits for the oil industry. These drilling tools frequently operate in wells at depths exceeding 13,000 ft in hard formations of lime, dolomite, anhydrite, shale, chert, sand and granite, with a mixture of drilling mud, water and formation in suspension as the lubricant. The tools are subjected to immense loads, extreme abrasion, and sometimes high temperatures.

One of the materials used in manufacturing the drilling tools is an over-lay alloy facing metal which is produced in the plant foundry and supplied to the welding departments in the form of rods 1/4 in. and 3/16 in. in diameter. The methods developed to improve the quality and increase production of the facing rods are related by M. W. Williams, foundry manager.

Facing rods were formerly cast into baked sand molds which were stacked before pouring. This method was the usual "stack-molding" process; molds were poured statically. Each mold was dried, sprayed, stacked and clamped before pouring. This method had its disadvantages as it was difficult to secure true round rods in the small diameters from the sand molds. The parting lines of the molds were inherent producers of fins, and each rod required considerable hand grinding. Frequently, sand inclusions in the

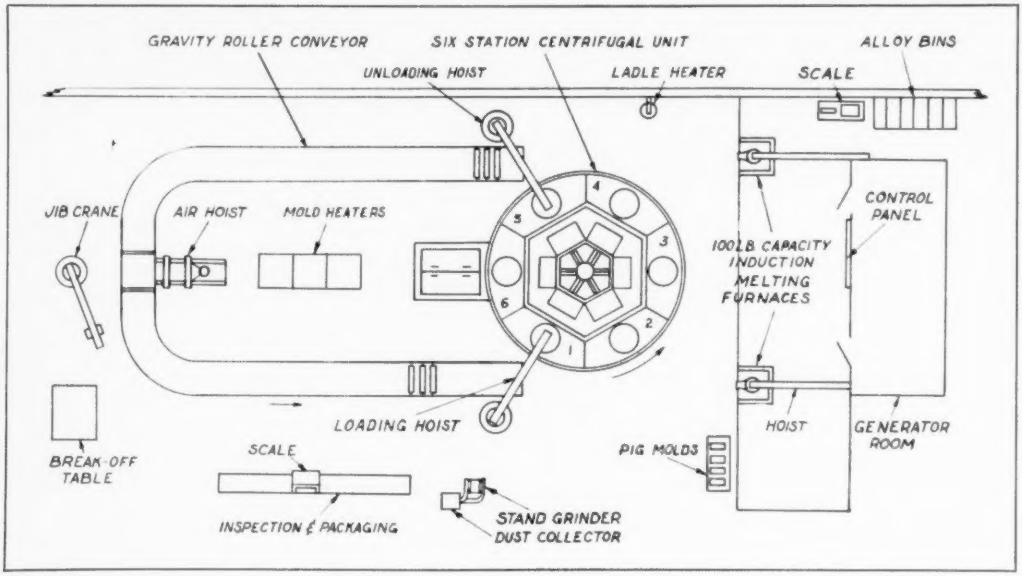


The lining of the induction furnace is kept warm by a 250-watt infrared lamp when the furnace is not in use.



The ladle heater is built of fire brick with a pipe fitting burner to control the natural gas-air mixture.

Layout of complete foundry for producing facing rods by centrifugal casting.



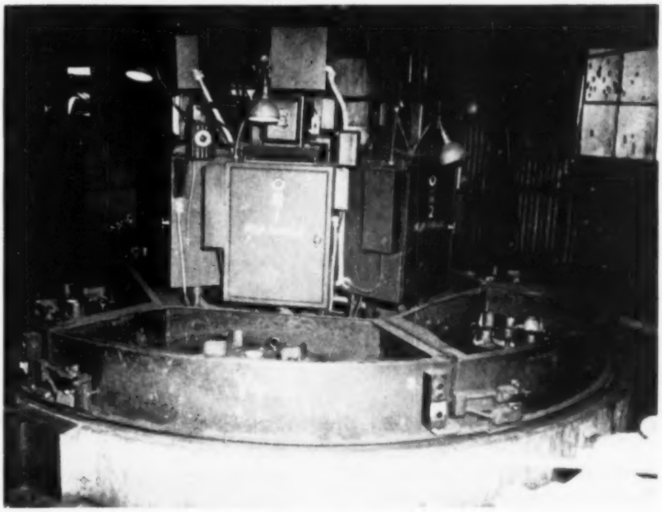
...MODERN FOUNDRY METHODS

rod made application of the metal difficult. Even with much care and precaution mis-runs occurred.

Extensive experimentation indicated that the rods could be cast successfully in a circular permanent mold with the rod impressions projecting from the mold center, provided the mold was rotated while casting. This method combined the advantages of a permanent mold and produced higher than static pouring pressures by centrifugal force.

The success of this study led to the layout and installation of the centrifugal rod foundry, complete within itself as all operations from melting to final packaging are performed in the area illustrated in the diagram.

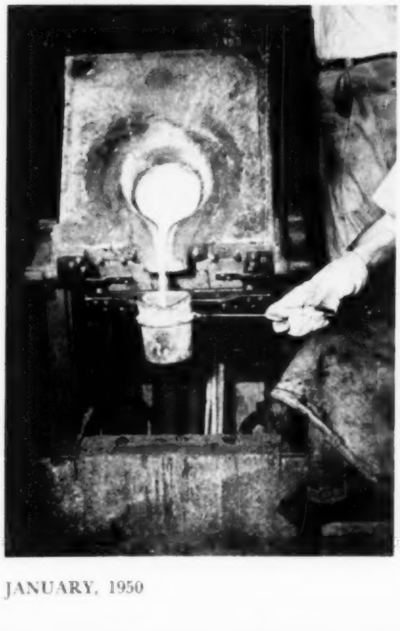
High frequency power at 3000 cycles is supplied the induction melting furnaces by a 100 KW motor generator. All power control is maintained from a single panel board which is wired so that the 100 KW input power can be maintained at a power factor of one by varying the capacitance of the circuit. The high frequency power is fed to either



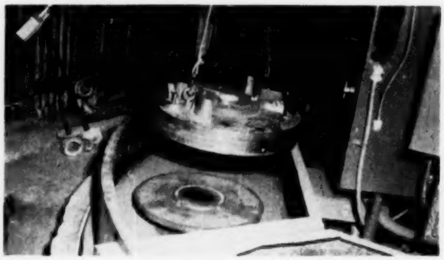
Six-spindle centrifugal casting machine loaded with permanent molds.

Pouring a rotating mold at position No. 3.

Tapping the heat into a hand ladle. The ladle handle is equipped with a sleeve, permitting it to turn with ease in the operator's hand.



MODERN FOUNDRY METHODS...

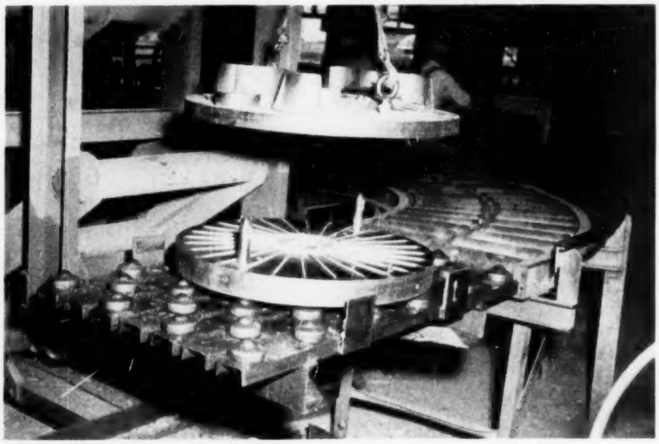


⬆ *The mold is removed from the centrifugal casting machine by an electric hoist.*

Mold is raised from lower elevation of unloading conveyor to upper elevation of loading conveyor by an air actuated lift table. ➡

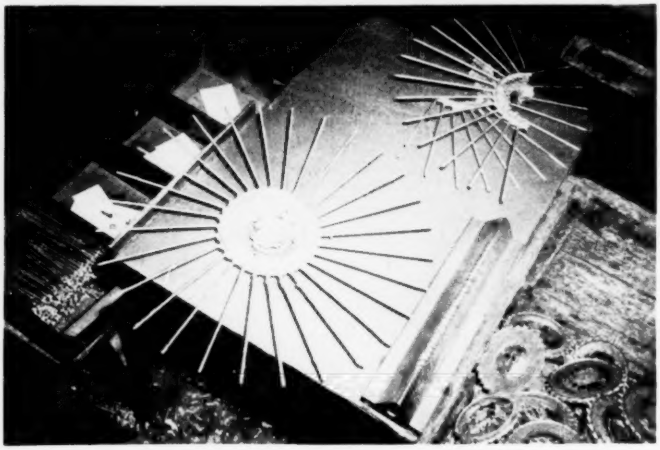
of the two 100-lb melting furnaces from the common control panel.

Metal charges are prepared, weighed and charged into the induction furnace by hand. A 100-lb cold charge can be melted in approximately 20 min when operating at full power output. The metal is transferred from the furnace to the



Cope section of the permanent mold has been lifted by an electric hoist for removal of the cast rods. ➡

⬇ *Rods attached to the center hub have been passed to the knock-off table. Rods from each heat are kept in individual boxes until chemical analysis is approved. The center hub is returned for remelting.*



spinning molds by a small hand ladle which holds enough metal to fill one mold.

The centrifugal casting machine consists of six vertical centrifugal spinners combined into a large turntable unit. This turntable unit operates automatically, and its time cycle can be varied so that each centrifugal spinner stops at the proper station for the desired period of time. The cast iron molds are removed from the roller conveyor and loaded onto the centrifugal unit at station No. 1, (see diagram).

At the end of the preset time cycle the turntable indexes to position No. 2, where the spinner table starts rotating. The spinner table is at the

...MODERN FOUNDRY METHODS

From the knock-off table the rods are passed to a stand grinder, which is equipped with a dust collector.

After grinding the rods are inspected and packaged.

desired pouring speed by the time it indexes to position No. 3, and metal is poured into the mold from the hand ladle. Power is cut off when the table indexes to position No. 4, and the mold has stopped rotating by the time it reaches position No. 5, where it is removed from the centrifugal unit and placed on the unloading gravity conveyor.

The molds then move by gravity to the air hoist where they are opened and the rods removed. The molds are cleaned and returned to the centrifugal casting machine by the loading roller conveyor.

In as-cast condition the rods are passed from the shakeout to a break-off table where they are removed from the center sprue. The sprues are returned for remelting and the rods go to a grinding station for finishing. After grinding the rods are given a visual inspection, weighed, packaged and transported to storage.

The welding rods manufactured in this shop have improved quality and weldability. The use of this equipment has decreased the problems of material handling. The combination of these mechanical elements into a modern production unit has accomplished increased production, decreased cost and improved working conditions.

Packaged rods are ready for transportation to storeroom.

The permanent molds are stored overnight and week ends in three thermostatically controlled heaters. The right-hand heater is in closed position; center heater has been filled with molds and cover is being lowered by an overhead crane; left-hand heater is empty.

BASIC PRINCIPLES COMMON TO FOUNDRY MELTING PRACTICES

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College of Engineering
The University of Wisconsin
Madison, Wis.

WITH FEW EXCEPTIONS the melting of metals and alloys in the foundry is essentially a melt-down process with no attempt made to refine. The principal exceptions are the melting of steel and malleable cast iron where some refining is usually accomplished. In other cases some change in composition may occur from oxidation, but this cannot be considered a refining operation since it does not represent a deliberate change; in many instances it is desired that the composition remain constant. When brass is melted, for instance, some zinc may be lost by volatilization and oxidation, but this loss is not intentional and results from the conditions surrounding the melting process.

In the cupola melting of cast iron, the oxidation occurs in the furnace with the result that a certain percentage of silicon and manganese is lost. Changes in the other elements may also occur, such as an increase in the sulphur content. None of these changes are initiated for the sole purpose of affecting the melt quality, but, rather, they occur because of the nature of the melting unit used. They are known and controlled changes, but are not required for the production of usable metal, since good cast iron can be melted down in an electric furnace with essentially no change in composition.

Steel Refined During Melting

Although steel melting for castings can be simply a melt-down operation, it is more common that some refining of the metal be achieved during melting. Oxidizing conditions are promoted, which cause a loss of carbon, silicon and manganese, and if the melting is done in a basic lining, phosphorus also can be removed. This change in carbon, manganese, and silicon content is illustrated by Briggs.[1]

In the basic electric process, it is possible to provide a reducing condition in the furnace by removing the original oxidizing slag and "building up" a new slag which is reducing in character. This will remove some of the sulphur from the steel.

In malleable iron melting in the air furnace it is necessary that sufficient oxidation of carbon and silicon occur so that these elements are low enough to prevent primary graphitization in the white iron castings. This might be considered refining by oxidation and can be followed indirectly by casting periodically so-called test sprues which indicate by their fracture appearance the relative amounts of these elements that remain in the heat. Since both elements when present in excessive amounts cause primary graphitization, and when at their proper values do not cause it, the presence or absence of primary graphite in the test sprues indirectly indicates composition.[2] This change in fracture appearance is shown in Fig. 2.

It is apparent that the common metals for castings are by and large not refined during the melting cycle. Changes in composition may occur through oxidation, which is most common, and only occasionally through a reducing action. Despite this apparent inertness regarding chemical changes taking place during melting, there are certain subtle yet very important reactions both of a physical and chemical nature that must be familiar to the melter if he is to control the melt quality adequately. Indeed, melting practices

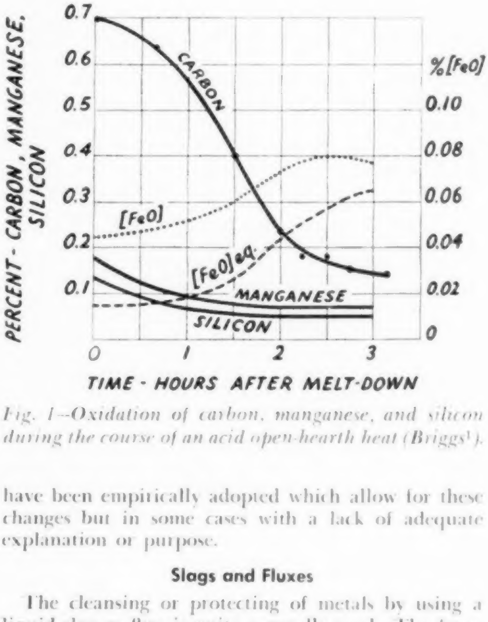

Fig. 1—Oxidation of carbon, manganese, and silicon during the course of an acid open-hearth heat (Briggs[1]).

have been empirically adopted which allow for these changes but in some cases with a lack of adequate explanation or purpose.

Slags and Fluxes

The cleansing or protecting of metals by using a liquid slag or flux is quite generally used. The functions and compositions of these slags vary but their ultimate purpose is to act as a collecting medium for extraneous materials not desired in the melt.

Steel slags are more or less unique in that they serve the dual purpose of a fluxing agent for the non-metallics formed in the bath and also act as a control over the composition of the melt. Variations are made in the composition and viscosity of the slag in order to effect desired changes in the melt. This is one of the few important instances where the slag refines as well as protects and collects impurities.

Slags are developed in the cupola and air furnace melting of cast iron to act as scavengers for the non-metallics. These slags, as least in the case of the cupola, are controlled in composition and amount to provide

NOTE: This paper was presented at the Wisconsin Regional Foundry Conference sponsored by the A.F.S. Wisconsin Chapter, at Milwaukee, Feb. 10-11, 1949.

the necessary fluidity and to improve melting conditions in the cupola. Some work has been done to investigate the role of these slags with respect to the properties of the metal. In the copper-base alloys, artificial slags composed of glass or of borax and sand and other mixtures are often used to protect against excessive oxidation. Charcoal serves somewhat the same purpose but it is not helpful in collecting dross or oxide.

In magnesium melting fluxing is extremely important, not only in cleansing the metal but also in protecting it from burning. Here the specific gravity of the slag becomes important because it must be adjusted to approximate that of the metal in order that it serve as a protective blanket at all times. One of the functions of the slag or flux as used for the light-metal alloys is to decrease the wetting power of the dross so that it separates cleanly from the metal. Chlorides, and complex salts containing chlorine and fluorine serve this purpose. In this instance, the flux is not a solvent for the dross but it changes its physical characteristics to cause it to separate from the metal.

Fluxes also rid a metal of dissolved gaseous impurities, as discussed later. No amount of fluxing or slag control will rid a metal of inclusions which have been in solution and which precipitate during freezing. These must be controlled by the composition or by the deoxidation treatment that is used.

Deoxidizing the Melt

Oxygen removal is referred to as deoxidation although it might also be considered as a reducing reaction, since certain oxides are reduced to the metallic state. Although the general principle involved is simple and straightforward and is applicable to many metals and alloys, the number of extenuating circumstances is almost unlimited. The basic idea is that residual oxygen in any considerable amounts is detrimental and hence should be removed. This removal is accomplished by adding a metal to the melt which has a greater affinity for the oxygen than has the base metal. The product of the reaction between this added metal and the oxygen is a compound which is either a solid, liquid or gas and which leaves the base metal virtually free of oxygen, or else changes the oxygen to an innocuous form which remains in the base metal.

The ability of a metal to deoxidize can be measured in terms of the heat of formation of its oxide, expressed in heat units per gram atom of oxygen. Such a classification places elements like calcium, magnesium and aluminum near the top of the list as far as deoxidizing ability is concerned. No metal is a universal deoxidizer and any one of a large number of restrictions is sufficient to rule out an element as a deoxidizer in a specific instance.

Among the restrictions that might be listed for a deoxidizer are:

1. It must thoroughly deoxidize.
2. Deoxidation product must be easily removed from the melt.
3. It must be soluble in the base metal.
4. Cost must be low.
5. Residual content of the deoxidizer in the base metal must be low or not harmful to the metal properties if present as a residual.
6. Deoxidizer must be readily removed from the metal when it is remelted.
7. Deoxidizer should create no great disturbance when added to the bath.
8. It should mix well.
9. Products of deoxidation should be non-toxic to personnel.

Steel is deoxidized by such elements as carbon, manganese, silicon, aluminum, and calcium. Normally, carbon would be ideal because it leaves no harmful product, but it is not particularly potent in the bath and may react during solidification with residual oxygen with the result that blowholes or pinholes will develop in the casting. Manganese and silicon are reasonably effective and the oxides or silicates formed are readily slagged off, but these elements leave considerable oxygen in solution unless used in fairly large amounts. This oxygen comes out of solution during freezing to form silicate inclusions.

Aluminum is much more effective than the others previously discussed, but it too has its limitations. Critical additions of aluminum tend to affect the distribution of the sulphides, causing them to take an undesirable grain boundary pattern. Calcium could be and is used, but because of its low boiling point it is difficult to handle and is best added as an alloy to reduce excessive agitation of the bath.

Inoculants as Deoxidizers

Gray cast iron and malleable cast iron are normally considered to be so thoroughly deoxidized that no further deoxidation is needed or even recommended, but it is believed that this subject has not been explored as completely as it might be. There is evidence which suggests that a deoxidation treatment of malleable cast iron has a marked influence in speeding the rate of primary graphitization.

The so-called "inoculants" that are used in gray cast iron are usually good deoxidizers in the sense that they

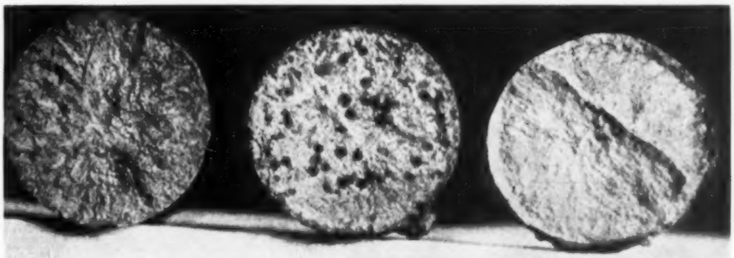

Fig. 2—Test sprues showing the effect of removing carbon and silicon by oxidation on the primary graphitization of the iron. Left—gray fracture indicative of high carbon and silicon; right—completely white fracture obtained when the carbon and silicon contents are lowered sufficiently; center—mottled iron, as a result of incomplete oxidation.[2]

TABLE 1—MAXIMUM AMOUNTS OF PHOSPHORUS REQUIRED TO DEOXIDIZE DEGASSED TIN BRONZE[3]

Degassing Method		Phosphorus Required, %
Manganese ore at bottom of crucible		0.04
Flux Cover	1 part cupric oxide 2 parts sand 2 parts borax	0.06
Flux Cover	1 part cupric oxide 1 part sand 1 part borax	0.08
Scavenging with dry air (bubbled through melt)		0.08

contain elements like aluminum, calcium, and vanadium. Perhaps this inoculating effect which has been attributed at various times to a "silicate slime" effect, to gas content, or to the formation of graphite nucleating particles, might merely be the result of a change in the diffusion or graphitizing rate of carbon as the result of the reduced oxygen content. In the case of both gray cast iron and malleable cast iron, the amount of residual deoxidizing element has a decided effect on the final properties of the material, which definitely limits the amount that should be used.

Residual aluminum in gray cast iron is said to promote porosity, and this is probably why aluminum has had a bad reputation in this field. It may be that this bad effect results because the aluminum is not removed in sufficient quantity during remelting to prevent it from behaving as a reducing agent and thus leading to the absorption of hydrogen. Aluminum residuals in cast steel are not objectionable and this may be because it is completely removed during remelting.

Copper-base alloys are deoxidized by such elements as zinc, phosphorus, lithium, calcium alloys, and boron alloys. Aluminum is not too frequently used because it tends to form a tenacious oxide film that may become entrapped in the casting. It is suspected that some of the difficulties encountered in melting copper-base alloys containing such strong deoxidizers as aluminum or silicon as alloying elements are connected with the action of these elements as reducing agents which favor gas pickup. In this connection, it has been pointed out that degassing of copper-base alloys through an oxidation-reduction procedure (discussed later) is not satisfactorily accomplished when phosphorus or zinc (both good deoxidizers) are present in the alloys.

The actual amount of deoxidizer to be used in a specific instance will vary, of course, and good judgment on the part of the furnace operator must be exercised to assure that the treatment is carried out properly. As an example of how the amount may have to be adjusted to meet a variety of conditions, Table I has been presented to show how a deoxidizing addition of phosphorus had to be changed to meet the requirements of the several degassing treatments used.[3]

Aluminum and magnesium-base alloys present the interesting problem of base metals which are already good deoxidizers. Therefore, they are not amenable to deoxidation but must be treated in other ways to improve the melt quality.

Grain Size Control

Our basic information on grain size control is meager. We know that grains form by a process of nucleation and growth, that temperature variations play an important part, and that nucleation can sometimes be modified by a "seeding" or inoculating action. But our control methods are crude for grain refiners do not provide absolute and controllable grain sizes. The best we can do to control grain size is by modifying the conditions surrounding the pouring of the metal, which in turn affects the cooling rate, and hence the grain size.

Steels are sometimes treated with aluminum, vanadium, or titanium for grain size control. Copper-base alloys are generally not susceptible to grain refinement by inoculation additions. On the other hand, the eutectic Al-Si alloy can be refined by a calcium addition, and other aluminum-base alloys have been treated with titanium or boron for grain refinement. Sicha and Boehm[4] have shown the effect of titanium on grain size when added to a No. 195 aluminum casting alloy in amounts of 0.00, 0.05, 0.10, 0.20, and 0.40 per cent.

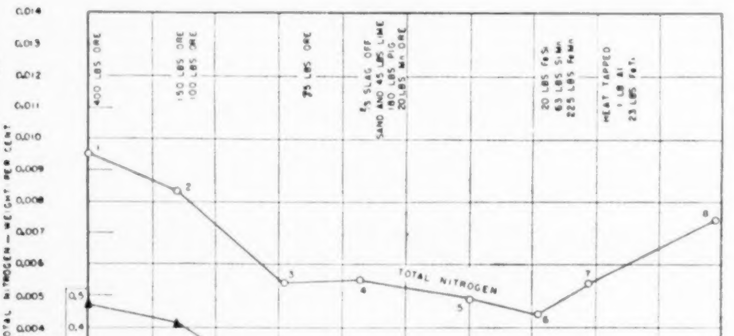

Fig. 3—The relationship between nitrogen content and the carbon boil in a 6-ton acid arc furnace heat of manganese-molybdenum steel.[6]

Magnesium alloys are commonly superheated to refine the grain. This is at variance with some other metals which would be adversely affected by such treatment. The effects are quite marked, as shown by Nelson.[5] This effect of superheating on magnesium alloys has been explained as being caused by the solution on heating and subsequent reprecipitation during cooling of grain-refining nuclei present in the alloy. Carbon, added for example as carbon tetrachloride vapor, is also an effective grain refiner, presumably by being present as finely divided carbon or carbide particles to serve as nuclei. Treatments with anhydrous ferric chloride or lump magnesite are additional methods used to refine the grain of magnesium alloys.

freezing is that the binary eutectic, instead of freezing as fine particles, freezes progressively on the nuclei established at the start of freezing with the result that a coarse structure develops. Such reasoning is thermodynamically sound, since binary precipitation in a ternary or multi-component alloy is not restricted to a constant temperature.

By the same reasoning it might be argued that a certain amount of temperature drop in the freezing of eutectics is a good thing if extremely fine structures are to be avoided. Thus, in the case of the spheroidal graphite cited earlier, in order for these graphite spheroids to grow to any finite size it would appear that a certain temperature interval for this freezing

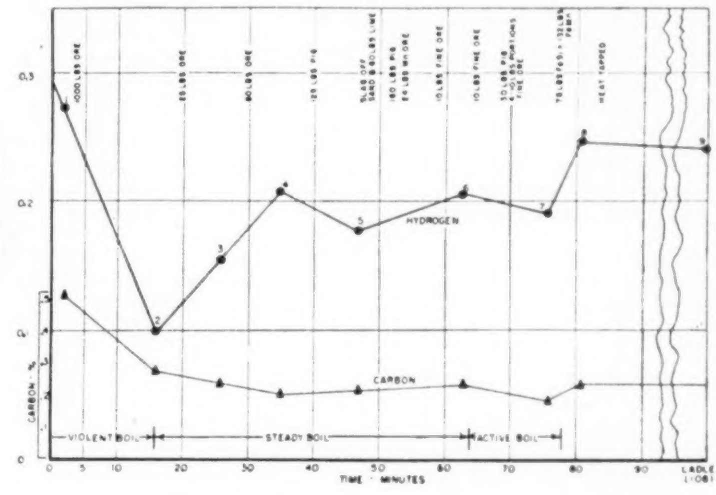

Fig. 4 — Graph showing the change in hydrogen content during the progress of a 5-ton basic arc furnace heat.[6]

Progress in grain refining treatments for cast iron is quite marked. Recently the rather spectacular development of spheroidal graphite in gray cast iron has been announced. The production of this iron appears to stem from a close control of composition plus the seeding effect resulting from an addition of cerium or magnesium. The use of "inoculating" agents to control the graphite flake size of gray cast iron has long been known. The exact mechanism whereby these elements operate in this manner is still open to speculation.

It may be more than coincidental that metals which go through a period of eutectic solidification seem more susceptible to inoculation than those which freeze as straight solid solutions. Eutectic solidification naturally leads to a finer distribution and it occurs over a smaller range of temperature than the solid solution type. From what we already know about the effect of temperature gradients in the bath favoring large columnar grains it is also conceivable that an extended solidification range might have a similar effect in solid solution alloys.

A peculiar primary grain structure that sometimes appears in certain magnesium-base alloys has been explained as the result of a binary eutectic precipitation occurring over a slight temperature drop such as is typical for binary eutectics occurring in ternary alloys. The result of this temperature drop during the binary

to take place would favor the optimum particle size if it is assumed that they start to grow as soon as the eutectic begins to freeze.

Gas Removal by Boiling or Agitation

In the melting of steel for steel castings, whether it is acid or basic practice, open-hearth, electric or converter, the steel melt undergoes a period of high oxidation when the elements such as carbon, silicon, and manganese are reduced in amount. The practice is usually such that a "carbon boil" is initiated during the melting cycle. This "carbon boil" is simply the evolution of carbon monoxide resulting from the oxidation of the carbon in the melt. Although the maintenance of this boil is not absolutely necessary for the production of steel, it does aid tremendously in the production of good quality steel, and the practice is much more frequently used than not.

Benefits to be gained from the boil are a natural stirring action which aids in the refining of the steel, in the removal of oxidized materials by delivering them to the slag where they are absorbed, and in the removal of dissolved gases through a purging action by the CO gas. This last effect is probably as important or more so than any other. A vigorous boil is one of the requirements which must be met if sound, good quality steel is to be produced. The action of this "carbon

boil" is to create many small bubbles of CO into which gases such as hydrogen and nitrogen can diffuse from the metal as the CO bubbles move to the surface of the steel.

If diffusion is at all possible, any gas will diffuse towards a point where its partial pressure is low, and this is the mechanism which accounts for the removal of these gases through the medium of the "carbon boil." The CO bubble when first formed will be free of hydrogen and nitrogen, and on its ascent to the surface it will tend to collect these gases and deliver them to the surface where they are dissipated. If allowed to remain in the steel these gases would contribute toward porosity, lack of feeding, pinholes, brittleness, and other defects in the casting.

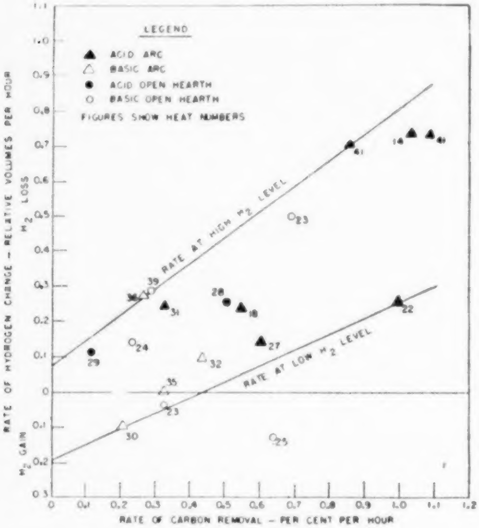

Fig. 5–Effect of the vigor of boil on hydrogen removal.[6]

Evidence of the drop in hydrogen and nitrogen contents during the course of the carbon boil is given in Figs. 3 and 4. Figure 3 shows how the nitrogen content of a 6-ton acid electric arc furnace heat was reduced by the carbon boil, while Fig. 4 shows similar effects for hydrogen in another 6-ton acid arc heat.[6]

Actually, the rate of carbon removal is important, since the more vigorous the boil the greater the reduction in hydrogen content (Fig. 5).[6]

Treatments similar in principle to the "carbon boil" in steel are used in melting light metal alloys. These alloys are quite susceptible to porosity arising from gas absorption, and one of the recognized methods for eliminating this porosity is by mechanically removing this gas through a bubbling action using some insoluble gas such as chlorine or nitrogen, or halogen salts which decompose at the melting temperature and release an insoluble gas which bubbles up through the metal, collecting the hydrogen on its way. Figure 6 illustrates the effect on the microstructure of an aluminum alloy after degassing with nitrogen.[7]

Gaseous agitation is not so common in copper-base alloy production, although nitrogen can be used to eliminate gases dissolved in copper-base alloys, as shown by Kurzinski.[8]

A process which may be related to the "boiling" treatments used for steel and the light-metal alloys is sometimes applied to the high-zinc copper-base alloys. It consists of heating the alloy sufficiently high before pouring to cause excessive volatilization or "flaring" of the zinc for a definite period of time. This action, evidenced by the formation of excessive quantities of zinc oxide smoke created by the oxidation of the zinc vapor, is considered an effective means of improving the physical properties of the metal. The zinc lost by the "flaring" action is generally replaced by a zinc addition before pouring. No real boiling action takes place, but presumably the rapid evolution of the zinc vapor from the melt surface prevents entrance of hydrogen and also aids in removing hydrogen by carrying it along as it leaves the surface.

Gas Removal by Reaction

Of the three common gases–oxygen, hydrogen, and nitrogen–nitrogen is relatively inert, although occasionally it can be quite strong in its chemical action. Oxygen is an oxidizing agent, that is, it tends to form oxides of the metals, whereas hydrogen is a reducing agent–it reacts with oxides to reduce them to the metallic state or it will react directly with oxygen to form water vapor. The latter mechanism is another way in which steel is kept relatively free of hydrogen gas, because if the metal is continually in a high state of oxidation during the melting-down period, it would not be possible for much hydrogen to accumulate without the oxygen present reacting with it to carry it off as water vapor, a gas essentially insoluble in metal.

Conversely, if a metal were kept in a reduced condition by a strong reducing agent such as aluminum, there would be a chance for considerable absorption of hydrogen since it would not be oxidized and removed. As mentioned earlier, that may be the reason why excessive aluminum cannot be tolerated in gray cast iron scrap. The effect of the presence of the reducing elements, phosphorus and zinc, in preventing cleansing of the metal through oxidation has already been mentioned.

An oxidized state is to be preferred generally because, although present throughout melt down and during refining, oxygen can be removed readily by deoxidation before pouring. On the contrary, a metal cannot readily be treated to rid it of its reducing elements, and if it remains in a reduced state the hydrogen then absorbed can–during the course of transferring the metal to a mold–react with oxygen absorbed from the atmosphere or other sources. It may be possible that if the reducing element also forms a hydride, e.g., calcium, its presence in the melt may be beneficial rather than harmful.

Although oxidation followed by reduction is the most common procedure, a practice has been developed whereby certain copper-base alloys have been melted under a reducing atmosphere using natural gas fuel, and subsequently oxidizing the heat by blowing air through it. Thus, the usual oxidation-reduction process was reversed. Advantages claimed among others are elimination of slag build-up and less melting loss.

Occasionally, during the production of steel by the basic two-slag process (wherein the first oxidizing slag is removed and a second, reducing slag, is built up) defects from excessive gas may result in the metal because during the second refining period conditions are proper for hydrogen absorption. Thus, it is never recommended that the second refining period be prolonged more than necessary. In acid practice, reduction of silicon from the furnace lining or slag by reaction with carbon can be accomplished when temperatures reach the neighborhood of 3000 F. This high temperature plus the reducing conditions present may also contribute to excessive gassing of the metal.

Melting Under Oxidizing Conditions

Since the presence of oxygen will prevent a large degree of hydrogen absorption, the benefits to be gained from melting under oxidizing conditions are well indicated. In the case of steel production, such effects are obtained as a matter of course. In the melting of other metals they have to be induced. Thus, in the melting of copper-base alloys, it is generally recommended that a neutral or slightly oxidizing atmosphere be used, and that a reducing atmosphere should be avoided. A reducing atmosphere will favor hydrogen pick-up, whereas a neutral atmosphere will prevent either excessive hydrogenation or oxidation.

Controls usually are not accurate enough to allow for a neutral atmosphere continually; consequently, a slightly oxidizing atmosphere brings the melting over to the safe side. There is no reason why an extremely oxidizing atmosphere could not be used except that it is uneconomical both from the combustion and metal loss standpoints.

The result of melting under a reducing condition is brittle metal. These effects can readily be determined by pouring test bars from melts made under a variety of gas-air or oil-air ratios in furnaces fired with these fuels. Table 2 gives data obtained from two heats having a variation in furnace gas composition.[9] The samples were subjected to a 90° bend test after coldrolling and annealing.

The effect of melting under various atmospheres on the porosity of tin bronze as determined by x-ray and density measurements are shown by Hesse.[10] Of the

TABLE 2—EFFECT OF FURNACE ATMOSPHERE ON DUCTILITY IN A COPPER-BASE ALLOY[9]

Melt	Fracture	Atmosphere Compositions, %			
		CO_2	O_2	CO	H_2
1	Brittle	7.1	0.1	7.1	6.1
2	Ductile	9.8	3.5	0.1	0.0

gases tested, hydrogen and water vapor (presumably partly dissociated during melting) are seen to cause the greatest porosity.

Whether or not a furnace is reducing or oxidizing can be determined by various means. Casting of test bars and analyzing of the gases have been cited as two methods. Other ways are by observing whether the metal in the furnace shows a clear, unoxidized surface, which indicates a reducing condition, and by passing a cold piece of zinc through the flame. If the zinc shows evidence of discoloration, the flame is reducing. If the color of the zinc is unchanged, the flame is oxidizing.

It is not uncommon for oxygen to be deliberately added to a copper-base melt with the idea of eliminating reducing gases. Such treatment naturally puts the metal in a highly oxidized condition, but if it is then subsequently deoxidized with zinc, phosphorus or some other suitable deoxidizer, insoluble oxides are produced which separate from the melt and consequently the oxygen is rendered unharmful in the metal properties.

Eliminate Hydrogen by Gas Reaction

The treatments used to rid steel and copper-base alloys of hydrogen by a gas reaction are pretty much the same except that they may be effected in different ways. The light-metal alloys, however, present a different problem. Both aluminum and magnesium-base alloys are highly reducing in character; thus the addition of oxygen would merely result in oxidation of some of the metal rather than in removal of any gas. Therefore, gas removal in these alloys cannot be done by a reaction between the reducing gas and oxygen.

Fortunately, hydrogen is not often considered a source of difficulty in the melting of cast iron, because here oxidation could not be readily used to get rid of

Original Melt Badly Gassed | **After Fluxing ½ hour** | **After Fluxing 1 hour**

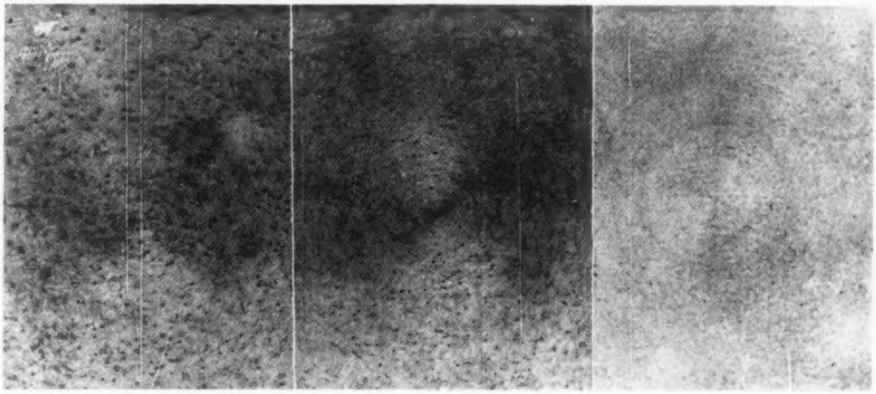

Fig. 6—Example of how fluxing with nitrogen reduces porosity of an aluminum alloy.[7]

TABLE 3—SOLUBILITY OF HYDROGEN IN COPPER AND COPPER-TIN ALLOYS

Composition	Solubility in cc of H_2 per 100 Grams of Metals at 2012 F	at 2192 F	at 2372 F
Pure copper	5.9	7.4	9.4
90% copper, 10% tin	4.4	5.5	7.0
80% copper, 20% tin	3.0	4.0	5.2

it, since other oxidizable elements are present in relatively large percentages. It is possible that hydrogen removal might in some instances prove beneficial.

Other Gas Removal Methods

Recognition of the rather simple laws governing gas absorption and evolution in metals makes it possible to utilize other methods for controlling the gas content of castings. It is an established fact that the gas solubility decreases with a decrease in temperature in the common metals in both the liquid and solid states. These changes are illustrated in Fig. 7 for aluminum[13] and Fig. 8 for a few other metals,[1] and in Table 3 for copper and copper-tin.[11] Furthermore, there is a decided drop in solubility at the freezing point. If metal is slowly cooled, much of its dissolved gas can be liberated by its diffusion to the surface.

This means of gas removal is well known, and in some instances the practice is to cool the metal slowly to the pouring temperature or, better yet, allow it to freeze in the melting pot, then remelt quickly and pour. It has often been stated that an alloy prepared from virgin metals is of better quality if first poured into ingots and then remelted for castings than if poured directly into castings.

Although the improvement in properties which results from this precasting technique may be caused by the better mixing of the alloys, it is possible that gas removal also is a factor. Gas removal by precasting

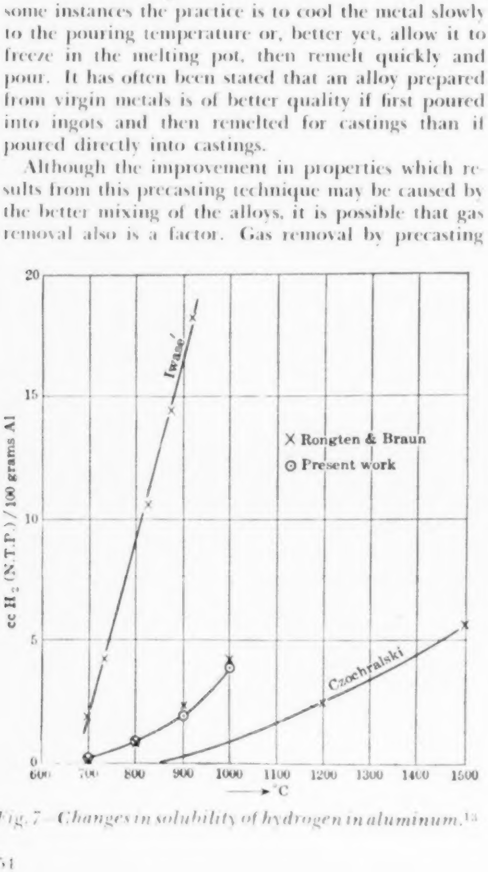

Fig. 7—Changes in solubility of hydrogen in aluminum.[13]

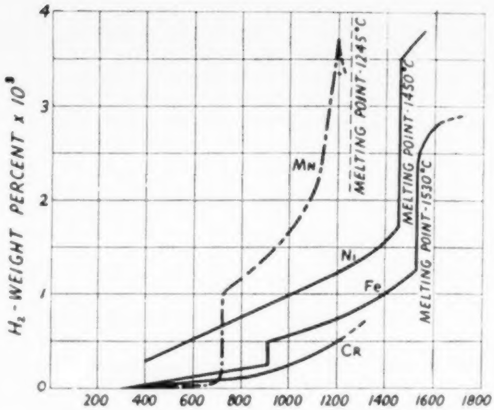

Fig. 8—Hydrogen solubility changes in several metals.[1]

is practiced with the non-ferrous alloys, but ferrous alloys are seldom if ever handled in this way.

Controlled slow pouring of castings is another means that will aid in ridding the melt of gas. As the casting slowly solidifies, gas can escape and the shrinkage which develops can be fed by the metal poured in later.

Avoiding Gas in Castings

Prevention of gas absorption is the first step in improving the quality of the castings. The fact that the gas can be absorbed from materials in contact with the melt—either solids, liquids, or gases—indicates that the best preventative procedure is to avoid anything in contact with the melt that will allow gas to be absorbed.

Perhaps foremost in this respect is to avoid moisture or moisture-bearing materials. Moisture is readily dissociated into hydrogen and oxygen when in contact with metal at high temperatures, and the hydrogen so produced, being nascent or atomic in character, is readily absorbed by the melt. This reaction can occur to a greater or lesser degree with both ferrous and non-ferrous alloys. The sources of this hydrogen are moisture in the furnace gases or air supply, moisture in insufficiently dried furnace and ladle linings, excess moisture in green sand molds, etc.

Other sources are wet or rusty scrap or wet fluxing materials. Any hydrogen-containing material or compound which is in contact with the melt and which is subject to dissociation is a potential source of hydrogen. Table 4 gives data which illustrates the effect of humidity on the size and severity of pinhole porosity in aluminum alloy castings.[12]

Agitation of the metal during pouring and in the mold also favors hydrogen absorption because of the greater contact of the metal with the moisture in the mold. This source of hydrogen is particularly disastrous in aluminum and magnesium alloys since the gas, once absorbed, is not subject to removal by an oxidation reaction such as can be utilized in the ferrous metals.

In cast steel, for instance, gas holes can be avoided by deoxidizing the steel with aluminum before pour-

TABLE 4—EFFECT OF HUMIDITY ON PINHOLE POROSITY IN ALUMINUM ALLOY CASTINGS[12]

Grams Moisture per cu ft of Air	Furnace Type	No. of holes per sq in	Size of holes
2.00	Tilting	5	very fine
2.90	Tilting	5-35	very fine to medium
5.6	Tilting	100	fine to medium
2.90	Barrel	75-105	medium
4.50	Barrel	60-105	medium to very large (3/64-in. diam.)

ing. The presence of this aluminum will prevent the hydrogen from reacting with dissolved oxygen to form water vapor. In the aluminum alloys this reaction, of course, is not possible, but the gas can nevertheless create gas holes and porosity by virtue of its extremely low solubility in the solid state, which means that it will tend to evolve during solidification of the metal.

Low permeability, excess moisture, underbaked cores, hard ramming, and conditions similar to these all tend to favor poor quality castings since they produce an excess of reducing gases in the mold which can be absorbed by the metal. It should not be overlooked that these conditions are interrelated, for where there is an initially low moisture content, high permeability is not required. In investment casting or die casting work, for instance, permeability of the mold is of minor consideration because there are relatively no harmful gases to be vented.

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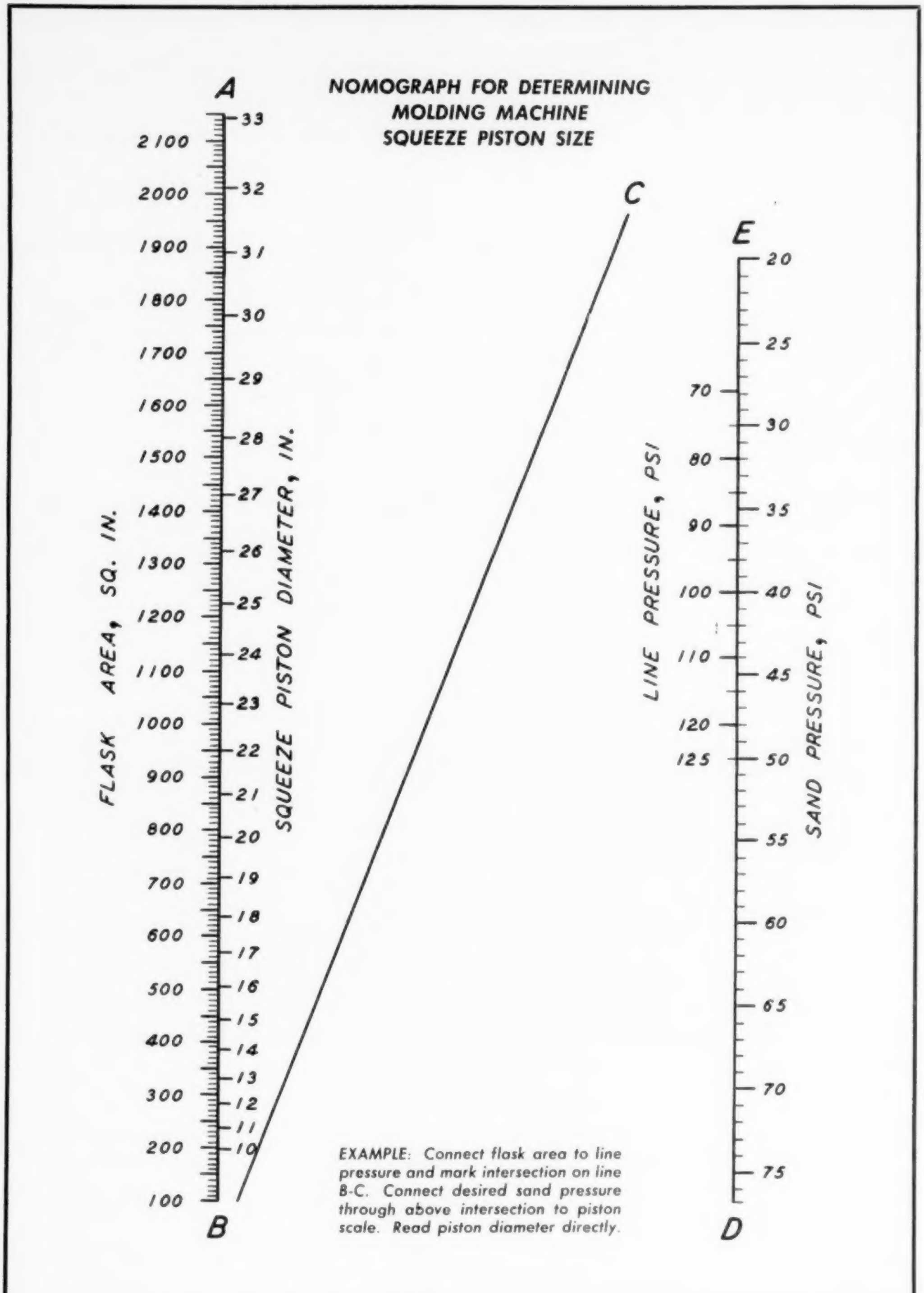
Belgian Foundry Association Elects

NEW PRESIDENT and general secretary of the Association Technique de Fonderie de Belgique are, respectively, Ivan Lamoureux, who helped the organization in 1911, and Jacques Foulon. They were elected following resignation after several years in office of René Deprez and Edwin Commins. The address of the secretary is 195, rue Saint Léonard, Liège.

Philadelphia Chapter Develops New Educational Program

Under Philadelphia Chapter's educational program for 1949-50 groups with common knowledge and essentially the same interests and background receive concentrated technical information on a single phase of foundry practice through a series of short courses. The first course, held November 9-11, 10:00 a.m. to 5:00 p.m. each day, consisted of lectures on sand theory and practice and demonstrations of the use of sand testing equipment. Lecturer was Frank S. Brewster (right), Harry W. Dietert Co., Detroit. Sponsored cooperatively by the Chapter, the Dietert Co., and the University of Pennsylvania where the sessions were held, the course was attended by 61 apprentices, foundrymen, educators, and salesmen. The Philadelphia Chapter's Educational Committee consists of Arnold N. Kraft, Wilkening Mfg. Co., chairman; Edwin A. Zeeb, Dodge Steel Co.; Herman E. Mandel, Pennsylvania Foundry Supply & Sand Co.; Clyde B. Jenni, General Steel Castings Corp.; J. J. Thompson, Fletcher Works; W. D. Bryden, Philadelphia Bronze & Brass Corp.; and C. W. Mooney, Jr., Olney Foundry Div., Link-Belt Co., Philadelphia.


NOMOGRAPH FOR DETERMINING
MOLDING MACHINE
SQUEEZE PISTON SIZE
A
B
C
D
E
FLASK AREA, SQ. IN.
SQUEEZE PISTON DIAMETER, IN.
LINE PRESSURE, PSI
SAND PRESSURE, PSI
2100
2000
1900
1800
1700
1600
1500
1400
1300
1200
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EXAMPLE: Connect flask area to line pressure and mark intersection on line B-C. Connect desired sand pressure through above intersection to piston scale. Read piston diameter directly.

HOW TO SELECT PROPER SQUEEZE PISTON SIZE IN MOLDING MACHINES

Walter W. Eichenberger
Sales Engineer
Milwaukee Foundry Equipment Div.
Spo, Inc.
Milwaukee

In the selection of a squeeze type molding machine the factor of primary importance is the size of the squeeze piston. The quality of the finished mold and the speed of the molding operation is dependent upon the piston size.

It is the purpose of a molding machine to produce in the shortest possible time a finished mold of sufficient hardness for the type of metal to be cast—aluminum, gray iron, steel, etc. This requirement cannot be accomplished if the squeeze piston in the squeeze type machine is too small to furnish the required squeeze force from the available air pressure.

In calculating the size of the squeeze piston required for molding several variables must be considered: (1) area of the flask in which the mold is to be made; (2) air pressure available at the machine; (3) sand pressure to which the sand in the mold must be squeezed in order to obtain sufficient mold hardness; (4) type of metal to be cast.

For different types of metals different mold hardnesses or sand pressures will be required. For example, a mold for steel must be harder than a mold for magnesium, and a mold for brass must be softer than a mold for iron. It must be remembered that the physical properties of the molding sand used, particularly flowability, can and do affect the final mold hardness. Because of the wide variations in sand practices, it is quite impossible to specify that a squeeze piston of a certain size will, at a given air pressure, produce a specific mold hardness. It is for this reason that the sand pressure value is used in the calculation of squeeze piston sizes for molding.

Nomograph prepared for making proper selection of squeeze piston size in molding machines.

As used in this article, sand pressure refers to the pressure in pounds per square inch to which the sand in the mold is subjected during the squeeze stroke of the molding operation. It is obtained by dividing the flask area into the product of the air pressure and the squeeze piston area. For example, flask size is 15 x 20 in. or 300 sq. in. in area, air pressure is 90 psi, and the squeeze piston is 16 in. in diameter or 201 sq. in. in area. Then

$$\text{Sand Pressure} = \frac{90 \text{ psi} \times 201 \text{ sq. in.}}{300 \text{ sq. in.}} = 60.3 \text{ psi.}$$

From the foregoing calculation it is seen that for a given flask area increasing either the air pressure or the diameter (area) of the squeeze piston, or both, will result in a greater sand pressure value during the squeeze, with a resultant increase in mold hardness. Since in most cases it is not practical or economical to operate air compressor equipment to furnish pressures at the molding machine of over 100 psi, the only remaining variable to be regulated is the selection of a molding machine with a squeeze piston size such as will be able to impart suitable sand pressures to the flasks to be used.

Different sand pressures are required for different metals; also, sand pressure requirements will vary even for the same metal, depending on the weight of the casting, heavier castings requiring greater sand pressures than medium or lightweight castings.

It has been the writer's experience that the following table of sand pressure ranges has proven satisfactory in many squeeze molding installations. Whenever sand pressures fell below the values listed for the various metals, casting defects allied to soft molds were encountered, i.e., erosion scabs, swells, misruns, washes.

	psi
Aluminum, Magnesium, Brass, Light Iron	20 to 30
Medium Iron	25 to 35
Heavy Iron	35 to 45
Light Steel	35 to 50
Medium Steel	40 to 55
Heavy Steel	50 to 75

For ease in calculating the piston size required for squeeze molding, a nomograph which can be read by means of a straightedge is herewith presented. A simple slide rule is also available.

Future Meetings and Exhibits

Malleable Founders' Society, semiannual meeting, Hotel Cleveland, Cleveland—Jan. 20.

Institute of Scrap Iron and Steel, Inc., annual convention, Hotel Statler, Washington—Jan. 22-24.

Birmingham Regional Foundry Conference, A.F.S. Birmingham District Chapter, Tutwiler Hotel, Birmingham, Ala.—Feb. 2-4.

Wisconsin Regional Foundry Conference, A.F.S. Wisconsin Chapter, Schroeder Hotel, Milwaukee—Feb. 9-10.

American Institute of Mining and Metallurgical Engineers, annual meeting, Pennsylvania Hotel, New York—Feb. 12-16.

American Society for Testing Materials, annual committee week, William Penn Hotel, Pittsburgh—Feb. 27-Mar. 3.

Ohio Regional Foundry Conference, A.F.S. Cincinnati District, Canton District, Northeastern Ohio, Central Ohio and Toledo Chapters, Netherlands Plaza Hotel, Cincinnati—Mar. 10-11.

Steel Founders' Society of America, annual meeting, Edgewater Beach Hotel, Chicago—Mar. 21-22.

Chicago Technical Societies Council, national production exposition, Stevens Hotel, Chicago—Apr. 4-8.

American Society of Tool Engineers, Philadelphia—Apr. 10-14.

54th Annual Foundry Congress and Exhibit, American Foundrymen's Society, Public Auditorium, Cleveland. May 8-12.

Electric Metal Makers Guild, annual meeting, Shawnee Hotel, Springfield, Ohio—June 1-3.

American Electroplaters' Society, fourth international electrodeposition conference, Statler Hotel, Boston—June 12-16.

American Society for Testing Materials, annual meeting and exhibition, Haddon Hall, Atlantic City, N. J.—June 26-30.

Radiography in the STEEL FOUNDRY

Richard M. Landis
General Electric X-Ray Corp.
Milwaukee

X-RAY EXAMINATION is used in the foundry as a non-destructive method of detecting the presence and location of internal cavities or other discontinuities in castings. The process of recording transmitted x-ray radiation to produce an image, or "shadow-picture" of an object is known as radiography. The resulting film is commonly termed a radiograph.

A radiograph is capable of showing (in most cases) the identity, location, and size of internal discontinuities or faulty conditions in a casting. To prevent misapplication of radiography, it is important to know not only what internal conditions can be shown, but also those which do not readily lend themselves to this method of examination. If effective use is to be made of the information revealed by a radiograph, it is necessary to know what conditions or situations are cause for rejection, and to be acquainted with the fabrication technics and the intended use of the part or section. Proper correlation of the information shown by the radiograph with the quality of the casting examined is also important.

Sensitivity Defined

Radiographic sensitivity is a measure in percentage of the minimum thickness change which is evident in a radiographic image. Standard practice requires that radiographs show evidence of a minimum sensitivity of 2 per cent. Thus, if a 1-in. thick section of cast steel is radiographed, a thickness change (in the form of an increase or decrease in thickness) equal to 20/1000 in. or 2 per cent must be visible on the film. This sensitivity is quite easily produced in average steel casting radiography.

It is also essential that a radiograph show good image detail. The limit of detail resolution is partially determined by the grain size of the film. It is also affected by the x-ray source size, geometric relation of radiation source to film distance and object thickness, position of the x-ray film with respect to the specimen, secondary radiation, x-ray wave length, film processing, and other factors involving radiographic technic.

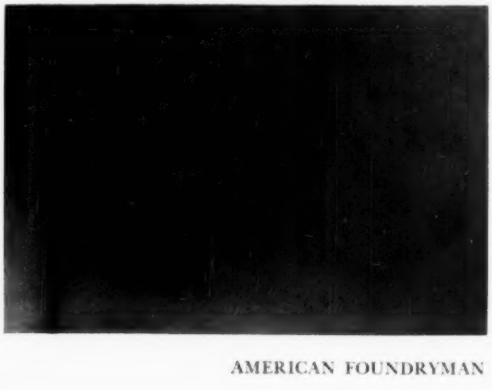
The user of x-ray inspection apparatus must keep in mind the purpose of each examination in order to utilize the many technic variables and produce the most informative radiographic film. Such factors as voltage, position of casting with respect to the central x-ray beam, length of exposure, selection of film, holders, etc., must be determined. Fortunately, there is ample latitude inherent in the film, technic selection, and general procedure to produce a usable radiograph even though a perfect combination of factors has not been used.

Internal cavities in castings are readily shown by radiographic examination. Flaws occurring in steel castings which can be revealed by radiographic examination are: shrink; hot tears; cracks; gas porosity and blow holes; sand inclusions; and lack of fusion around chills, chaplets, etc.

The condition shown in Fig. 1 is brought about by shrinkage stresses, producing a crack-line flaw or hot tear. External hot tears ordinarily occur perpendicular to and appear at the surface of the casting. Internal hot tears appear more randomly in the center of the general shrink area. Since x-rays travel in a straight line, the contours of flaws of this kind are accurately projected and registered on the film. Because a radiograph can be depended upon to faithfully reproduce the actual contours of internal flaws, it is a simple matter to identify them by viewing the film.

Stress cracks, which occur after solidification of the metal, ordinarily do not open up as wide as hot tears or shrink cracks. Also, they are not as likely to appear perpendicular to the surface of the casting. Stress cracks may run in almost any direction and, as a result, may not be shown by normal radiographic practice. When visible on the x-ray film, stress cracks have somewhat the same appearance as the hot tear image shown in Fig. 1. However, they are not as easily shown because they frequently occur as mere fractures where

Fig. 1—Images of a hot tear and the cavities of gas porosity are shown in this steel casting radiograph.



NOTE: This paper was presented at the A.F.S. Ohio Regional Foundry Conference, at Columbus, Ohio, March 12, 1949.

the parted surfaces of the crack are still in physical contact and do not provide the necessary thickness change to produce sufficient x-ray absorption difference required for radiographic detection.

Cracks are shown if the direction of the crevice has been positioned approximately parallel to the central x-ray beam. Since there is no assurance that cracks will follow a given direction, not all of them may be shown by radiography. X-ray examination can be relied upon to show the presence of large stress cracks under ideal conditions, but it is not a recommended procedure in instances where cracks are the only reason for inspection. Since stress cracks generally appear at, or extend to, the casting surface, other procedures such as magnetic or fluorescent powder inspection are used.

Figure 1 also shows the image of gas porosity. It is easy to identify these flaws because of the smooth, sphere-like shape of the cavity. Much can be learned about problems of molding and degassing by studying the size and distribution of gas porosity. Porosity consisting of cavities having a diameter greater than approximately 2 per cent of the total casting section thickness can be readily shown by radiography.

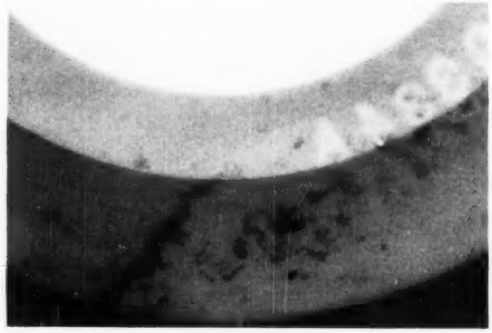


Fig. 2—Radiographic images of entrapped sand and gas formations in a steel casting are readily identified.

Sand may be washed into the mold if its mositure content is improper, if it is not properly molded, or if the sprue and runner design is faulty. Figure 2 shows the general appearance of entrapped sand in a steel casting. Note the evidence of gas formations which accompany these inclusions. Erosion or breakage of the core is easily detected and identified, although this example does not show such a condition.

Entrapped sand is easily identified because of the angular and irregular outline of its image in the radiograph. It is possible that surface indentations may be confused with the image of entrapped sand. However, this can be easily confirmed or ruled out by visual surface inspection.

The image of entrapped slag is much the same as that of sand. The location of occluded sand or slag with respect to the gate or runner feeding the mold serves as a clue to required changes in molding and pouring practice.

Lack of fusion, where a chaplet, chill, or other insert is used, can be easily shown by radiography. The x-ray image of lack of fusion appears very similar to that of a crack. A "blow" or gas cavity, caused by the chill used in this casting, is also visible (Fig. 3).

X-ray examination is valuable when used within a certain sphere of application. To summarize its limitations, it can be said that extremely small cavities or fractures which run in random directions may not be shown. Slight changes in metal composition will not be revealed; however, a segregation of metals in an alloy may be shown if they differ widely in x-ray absorption.

Large or unusual crystal structure in steel castings is not shown under ordinary circumstances. However, large crystal formations occurring in some of the high-temperature alloys used in jet engine and similar applications are easily shown by radiography, particularly in thin sections. In general, when the condition or flaw is not of sufficient size to be resolved by the film emulsion, it is said to be beyond the scope of x-ray inspection.

A survey of steel foundries now using radiography for the examination of castings discloses that it is being applied in: 100 per cent or routine inspection of output; research and development laboratories; inspection of weld repairs; molding practice development, and quality control.

X-ray inspection on a 100 per cent basis, was used extensively during the past war. Steel castings used by the Navy for highly-stressed hull fittings and all castings subjected to superheated steam were x-rayed 100 per cent. Those used in production of ordnance products subjected to high stresses were also routinely x-rayed. This does not mean that the entire area of all castings was examined by radiography, but rather that the vital areas or sections of each were inspected. While certain specifications still stand for the routine x-ray inspection of the present output of castings for

Fig. 3—A defect due to lack of fusion of a chill or chaplet has the appearance of a crack. The chill used in this casting also caused a "blow" or gas cavity.

use in defense equipment, the majority of civilian requirements are not as exacting.

A limited amount of 100 per cent x-ray inspection is carried out for purchasers of certain castings involving either expensive machining operations or an application where failure would mean injury or loss of life. The economics of each problem must be considered to justify complete x-ray inspection of a customer's order. The additional cost of routinely examining such a group of castings is ordinarily shared, if not completely borne by the purchaser. Many foundries equipped with x-ray apparatus often have occasion for 100 per cent inspection of a job lot.

Several organizations use radiographic examination of castings for fundamental research and development. Although this is a special application, its importance should not be overlooked because much basic information can be acquired away from the pressure and responsibility of the production foundry. Radiography is valuable in the study of new technics and has been used in the development of precision casting and certain permanent mold processes. One foundry laboratory making an extensive study of coremaking and treating problems used x-ray to assist the investigation and verify conclusions.

Radiography Aids Weld Repair

X-ray examination has been used for a number of years to assist in the weld repair of expensive and important steel castings. It is a valuable aid to foundries doing job-lot work where near-perfect castings must be delivered. The process is a simple one. After a cavity has been discovered through the use of radiography, the faulty area is chipped out and a qualified welder then fills the cavity with weld metal. After welding, the local area is x-rayed to make sure that the repair is sound. Considerable savings are effected in odd-lot casting production by making weld repairs.

When sub-surface flaws exist, weld repairs cannot be successfully undertaken without the use of radiography. In 1938 the U. S. Navy Bureau of Engineering established requirements of acceptability and prepared x-ray films showing acceptable, borderline and rejectable conditions in steel castings. A procedure was set up whereby certain rejected castings could be weld repaired and again x-rayed at the option of the foundry. As a result, the weld repair of high pressure and highly stressed steel castings for Navy use has become common steel foundry practice.

The most widely accepted application for radiography is in the development of mold practice. Most foundries operating an x-ray inspection department use it regularly to study the problems of molding and pouring practice. X-ray examination has been profitably used to:

1. Determine the proper position of the gate, risers or feeders, vents and chills, and establish their size or number and proper relative positions.
2. Increase the yield and reduce the labor costs by redesign and simplification of the mold, reducing the number and size of risers and runners to a practical minimum.
3. Eliminate the use of chills by redesign of the mold.
4. Assist in determining a molding practice for pouring a casting close to finished dimensions, and to reduce the finished casting weight by the use of cores.
5. Assist in establishing the proper pouring temperature and deoxidizing procedures.
6. Determine the proper drying requirements for the mold.
7. Study core problems such as hardness and moisture content.
8. Encourage employee interest by explaining improvements and results by showing films of typical examples.
9. Provide a permanent record of the evolution of specific casting jobs, and use this information in new casting practice problems and quality control.
10. Furnish evidence of quality to the sales organization and customers.

Sectioning and breaking castings to determine soundness and strength has been a universal practice in foundries not equipped with radiographic apparatus. Sawing, or sectioning, is time-consuming. It destroys the casting and may not reveal a satisfactory or presentable view of the internal condition.

Figure 4 shows part of a sectioned casting with a major shrink crack visible. Unless the sawed surface is ground, polished and etched, fine shrinkage may go unnoticed. A radiograph of the same section (Fig. 5) gives more information. The type of shrink shown near the center portion of the casting is difficult to

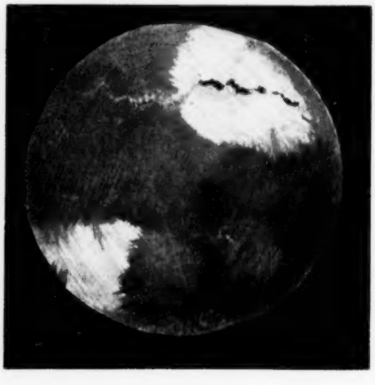
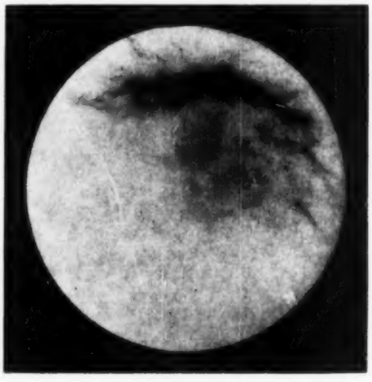


Fig. 4—A large shrink crack is shown in this sectioned part of a casting. Fine shrinkage may not be visible unless the cut surface is polished and etched.

Fig. 5—Radiograph of the same casting section shown in Fig. 4. The fine shrink near the center is difficult to show by the sectioning technic.



show by sectioning technics. Only careful preparation of the cut surface will reveal the presence of the finer types of shrink. Even if the shrink is sufficiently severe to be readily visible, the exact shrink center, or last point to solidify, is sometimes difficult to locate. Foundries employing radiography find that the nondestructive features of x-ray examination allow saving of time and material, and provide readily usable information for correction of practice faults. Although many variables are involved in mold design and pouring practice, making individual study difficult, x-ray examination has helped to isolate and investigate effectively various underlying causes of unsoundness.

Examples given by several typical steel foundries indicate the practical results obtained in developing correct mold and pouring practice through the use of radiography. One foundry producing cast-steel crankshafts, similar to that shown in Fig. 3, found in the development of a new casting design that x-ray showed lack of fusion at chills used at the bearing positions. Gas cavities, or "blows", from the chill resulted, as well as breakage of drills. Mold design changes, guided by x-ray examinations, eliminated the complicated chill technic and, as a result, perfect castings were made on a high production basis at a considerable saving.

X-ray Used in Melt Control

Another foundry experienced fine and uniformly distributed porosity in a certain run of castings. As this condition pointed to improper deoxidation of the metal, x-ray examination of control castings was used to aid in establishing proper deoxidation procedure. The use of x-ray in maintaining melt control has been reported by a number of foundries. The same foundry, in making a casting weighing 90 lb with the gate and runner system, found through x-ray studies that the runner length could be reduced sufficiently to pour the casting with only 84½ lb of steel.

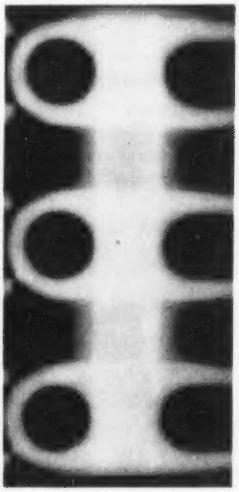
One foundry makes a practice of x-raying the gates and risers of unsound castings. In this way it is possible to learn how effectively each is performing its function, and changes which simplify the mold-feeding system are often indicated. By careful analysis of radiographic films, it is often possible to eliminate the use of chills by the judicious placement of gates, runners and risers.

Another foundry having difficulty with unsoundness in a gear blank casting learned through x-ray investigation that the runner design should be changed. This alteration resulted in a sharp reduction of machine shop scrap. Before x-ray apparatus was installed, the scrap rate on this casting was about 14 per cent. After corrective technics were employed, the scrap was reduced to 1.2 per cent.

In many foundries the knowledge gained through radiography is carefully recorded and used in setting up individual job production specifications. Radiography is then used for a period of time to make sure that no new detrimental conditions enter into the process. After the foundry process is reduced to a purely routine practice, the sampling percentage is reduced and only occasional x-ray checks are made.

Radiographic records are valuable when the foundry is called upon to duplicate a few castings from a previous job. It is easy to compare the soundness of the newly cast parts with those accepted from the previous lot. Also, a radiographic record of the evolution of practice changes made on a long-run job is helpful, particularly in the event of pattern redesign.

Radiography serves not only the production department of the foundry, but also the sales division. Users of radiographic equipment are careful to x-ray inspect and submit only acceptably sound castings to prospective purchasers of large orders. This is particularly true in the case of competitive buying, and where castings must be submitted for test, or may even be in competition with products fabricated by other methods.



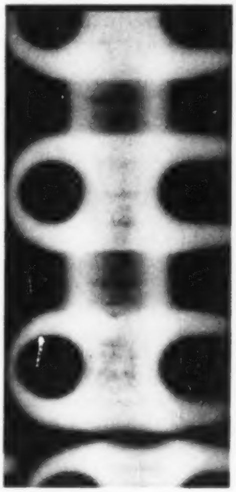


Fig. 6—Severe shrinkage (below) occurring in a malleable iron shackle fitting casting was eliminated by the application of corrective measures indicated by the radiograph. A casting made from the same pattern (above) was sound.

Salesmen for companies employing x-ray equipment use radiographic control as a sales aid in dealing with prospective buyers, pointing out the advantages of uniform casting quality and the accompanying reduction of machine shop scrap. They do not necessarily suggest the possibility of routinely radiographing castings, except in special cases, because they know that establishing correct foundry practice and maintaining it through radiographic control provides economies for both the foundry and customer.

Questions THE ROUND TABLE Answers

Abrasion Resistance Of Core Boxes

We have come upon the problem of evaluating core box materials and are particularly concerned with testing materials for abrasion resistance. Does the American Foundrymen's Society have a test for this?

The Society has no standard test or specification for abrasion resistance of core box materials. Some work on the subject has been done by H. J. Jacobson, Industrial Pattern Works, Chicago, and is reported in an article, *"Designing and Rigging for Core Blowing,"* in the August, 1948, issue of AMERICAN FOUNDRYMAN. The paper also appears in A.F.S. TRANSACTIONS for 1948, Vol. 56, page 602.

Mr. Jacobson describes tests of resistance to abrasion in which machined specimens were masked with a plate containing a standard sized hole. The specimens were sand blasted under standard conditions and the depth of cut was measured to 0.0001 in. with a ball point dial indicator. This test indicated that hardness was not a measure of resistance to cutting by sand since copper, brass, and aluminum sheet all rated higher than hardened drill rod.

Soft materials are used successfully in core boxes for blowing, several foundrymen reporting success with wooden boxes. A rubber-like plastic material for lining core boxes is in use in a high production foundry.

Does Nodular Iron Resist Zinc?

We have read the articles on nodular iron which have appeared in *American Foundryman* and other magazines but find nothing more than slight reference to corrosion resistance. While it appears that the material might improve permanent mold life for brass casting, do you think that the phenomenal physical properties reported would increase the life of a cast iron kettle used for melting and pouring zinc and zinc base die castings?

At present we have nodular iron ingot molds for non-ferrous metals on commercial test, but complete data are not yet in. However, the resistance of nodular iron to growth and its high mechanical strength indicate exceptionally good life as a mold and die material. Data from other sources indicate a life as an ingot mold of several times that of good gray iron. All indications are that resistance to thermal checking and cracking are high for nodular iron.

Pots or kettles for zinc and zinc base die casting also fail by penetration of zinc and by weakening due to decrease of section thickness by the solvent action of zinc. In this case the nodular form of graphite should help decrease penetration, although the solution of the matrix in the zinc should not be affected. The rate of solution of iron in zinc increases with silicon content of the iron, and most nodular irons are relatively high in silicon, but the net effect can be determined only by experiment. A plunger for a zinc alloy die casting machine made of nodular iron is still in service with apparently a long life ahead of it, but until it fails or freezes we will not know its life.

J. E. Rehder, *Foundry Engineer*
Canadian Bureau of Mines
Ottawa, Ont.

Pickle Rusty Stainless Castings

In using chilled iron shot for blasting stainless steel castings we have encountered rust on the finished castings. Is stainless shot available or can the rust be removed easily?

The most economical solution is to pickle the castings, a common operation, and not difficult in itself. Tank construction and heating the pickling bath present some problems. The usual mixture is 20 per cent by volume of concentrated nitric acid, two per cent hydrofluoric acid, and the balance water. The temperature is not critical—around 150 F is good. Time of pickling depends on temperature and surface condition. Usually 15 to 30 minutes is satisfactory, but a longer treatment does no harm. Rinsing can be done in any convenient way, the acid solution being readily washed off.

D. S. Scott
Buffalo Stainless Casting Corp.
Buffalo, N.Y.

Available Binders Will Do The Job

We are looking for a bonding material with which to make pump runner cores without wire reinforcements or mechanical vents. The binder must be essentially non-gas producing while developing high mechanical strength. We read about the mineral halloysite being used for strengthening and hardening green sand molds and cores in "Centrifugal Castings" (A.F.S. *Transactions*, vol. 52, pp. 273-312, 1944), by Peter Blackwood and John Perkins. Perhaps this is our answer.

Halloysite was found to have special applications during the war years, but since that time demand has not warranted its production. Many foundries have

had success with cores made from high strength green sand mixtures and this was the principle used in the halloysite mixes. Such mixtures for cores can be produced through the use of sufficient quantities of clay or bentonite to give the required green strength for the core to be handled in the foundry. Often arbors can be designed which will allow these cores to be made at relatively low green strength values and still provide good handling characteristics. Relatively small amounts of gas are produced by green sand cores and venting may be kept to a minimum.

Robert P. Schauss, *Fdry. Eng.*
Illinois Clay Products Co.
Chicago

Tests Useful Though Not Standard

Is there a standard fluidity test? If so, can you give fluidity figures which could be used as a guide in our foundries?

No method of measuring fluidity has been accepted as standard by the non-ferrous branch of the foundry industry. The fluidity spiral is generally used as a gage of the ability of a metal to "run," but the critical question of how best to introduce the molten metal into the spiral has never been acceptably answered.

Excellent work was done by C. M. Saeger, Jr., and A. I. Krynitsky (A.F.S. Transactions, vol. 39, pp. 513-540, 1931) and it would seem reasonable for any organization wishing to establish fluidity measurement or control, to use the method suggested in their paper as a starting point.

After a method has been chosen the next step is the establishment of a procedure which will give reproducible results when meticulously followed. The procedure must cover melting, degree of superheat, pouring temperature, method of pouring, sand properties, and method of molding. Patterns should be metal and their performance, if more than one is needed, should be carefully checked. No latitude should be allowed for individual opinions or variations. A good discussion and bibliography on fluidity can be found in *Metals Handbook*, 1948 edition, pp. 199-201, of the American Society for Metals.

A. K. Higgins, *Supt.*
Chem. and Met. Dept.
Allis-Chalmers Mfg. Co.
Milwaukee

By way of description of the fluidity test nothing could be added to the material contained in K. L. Clark's *"Fluidity Testing of Foundry Alloys"* (A.F.S. Transactions, vol. 54, pp. 37-48, 1946, and American Foundryman, vol. 10, pp. 35-46, July, 1946). So far as I know there is no standard form of spiral accepted by the industry, though the pattern equipment for one type of spiral can be obtained from certain suppliers.

The length of spiral required to indicate suitable fluidity for a given casting will depend on the design of the spiral chosen as a standard and that standard would probably not be the same for a long range of alloys. It would further depend on the amount of transport and handling that a given liquid metal would have to have between the pouring of the spiral and the pouring of the mold, and upon the size and shape of the casting to be made.

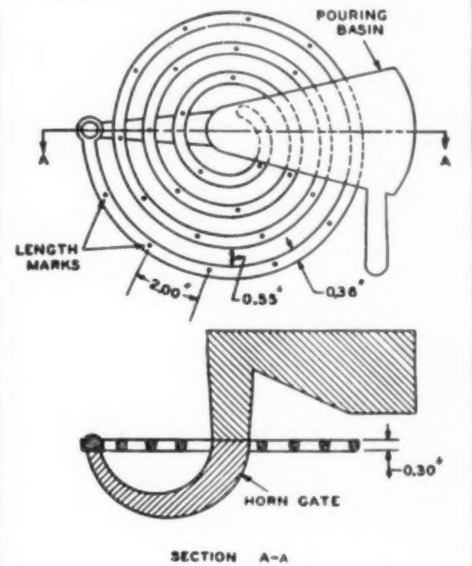
It is my opinion that no general standardization is possible except perhaps as to spiral form. Each foundry will have to select for itself the length of spiral necessary for its own metal, pouring conditions, and castings.

H. A. Schwartz, *Mgr. of Research*
National Malleable & Steel Castings Co.
Cleveland

OSRD Report 5634, *"The Fluidity of Cast Alloyed Steels and Irons,"* by W. S. Mott and R. H. Shaefer of American Brake Shoe Co., describes a fluidity spiral which I believe is a reliable fluidity standard. The report was published September 10, 1945, and has recently been removed from the restricted list. The test is poured in duplicate in a carefully assembled core mold and the reproducibility is excellent, but the technique is too exacting to be suitable for routine shop use.

From fluidity measurements with this test has come the concept of temperature measurement commonly referred to as "freeze point plus." This is illustrated by an example:

A cast iron of 3.0 per cent carbon and 2.0 per cent silicon has a freeze point or "mushing temperature" of 2270 F (liquidus). Raising or lowering the carbon 50 points (0.5 per cent) will, respectively, lower and raise the freeze point by about 100 F. All three of these irons will run the same spiral length if poured at, say, freeze point plus 250 F. In other words, fluidity is dependent primarily on degrees of superheat above the liquidus. This fundamental relationship has been shown to be equally valid for a copper-base alloy



Most fluidity test spirals in use today are essentially the same as this spiral suggested by Saeger and Krynitsky except in the light metals field where a flat spiral is often used.

(FP 1880 F) and a 0.35 per cent carbon steel (FP 2735 F).

Generally speaking, a good shop rule is to pour risered castings at freeze point plus 250 F and non-risered castings at freeze point plus 100 F.

N. A. Birch, *Div. Met.*
National Bearing Div.
American Brake Shoe Co.
Meadville, Pa.

Insofar as the light alloys are concerned, there is no standard fluidity test. As near standard as any is the test described by W. E. Sicha and R. C. Boehm in their paper "*A Fluidity Test for Aluminum Casting Alloys*" (A.F.S. TRANSACTIONS, vol. 56, pp. 502-507, 1948). Data on several alloys are given.

Apparent fluidity varies with alloy, with temperature, with purity, and perhaps certain other variables. Consequently "standard" tests have been only partly successful.

Donald L. Colwell, *Dist. Mgr.*
Apex Smelting Co.
Chicago

Steel foundries have used a spiral fluidity test but I do not believe the test has been standardized and adopted. We have used the spiral on a number of occasions, both on the furnace platform and on the pouring floor. Pouring rate and other variables influence the test. We obtain a shorter spiral on the furnace platform, pouring directly from a large spoon, than we do from a monorail ladle on the pouring floor. This indicates that pouring rate exerts a great influence upon the apparent fluidity for we know that we pour at higher temperatures at the furnace than on the floor.

Steel Metallurgist

Hardness Of Malleable Iron

Several of our customers have asked us about Brinell tests on castings we produce. Can you tell us what hardness we should receive on malleable iron castings made in air furnaces? How do these figures compare with the Brinell hardness of gray iron castings? Are we correct in thinking that malleable castings specifications do not include Brinell hardness?

Malleable iron castings made in air furnaces generally will vary between 110 and 140 Brinell hardness. Necessarily made within a relatively close chemical analysis range, and because of the annealing operation which is part of the production process, malleable iron does not vary greatly in hardness. Gray iron is rather rarely annealed and its range of analysis may be fairly broad; section size also affects hardness. Gray iron castings—with graphite in the flake form—may be produced with a Brinell hardness range from approximately 150 to 300, depending on the above factors. Malleable iron specifications do not include Brinell hardness numbers, largely because of the relatively narrow range of analysis and production techniques within which all of these castings are produced.

C. F. Lauenstein, *Chief Met.*
Link-Belt Co.
Indianapolis, Ind.

Foundry Advisory Committee Hears Reports On Latest Foundry Methods

LATEST DEVELOPMENTS in methods for the casting of nodular iron, aluminum, gray iron, bronze steel, malleable iron, and magnesium, and production of centrifugal dual castings and turbine rotors were reported at a meeting of the Technical Subcommittee of the Foundry Industry Advisory Committee, Munitions Board, held in the Pentagon, Washington, D. C., November 15.

Headed by Max Kuniansky, Lynchburg Foundry Co., Lynchburg, Va., industry subcommittee members and representatives of the Munitions Board, Army, Navy, Air Force, National Security Resources Board, Research and Development Board and U. S. Tariff Commission attended the meeting.

Featured at the meeting were reports by A.F.S. National Director T. E. Eagan, Cooper-Bessemer Corp., Grove City, Pa., and Harold N. Bogart, Ford Motor Co., Dearborn, Mich., who discussed nodular iron research conducted by their respective companies.

Gray Iron Founders Elect Officers, Discuss Problems At Annual Meet

HIGHLIGHTS of the Gray Iron Founders' Society's two-day Annual Meeting, held October 27-28 at the Edgewater Beach Hotel, Chicago, were election of officers, a session on nodular iron, presentation of business papers, committee and group reports, and a number of social events.

Re-elected president of GIFS, 1949-1950, was Hermann P. Good, Textile Machine Works, Reading, Pa. Other officers elected were: vice-president, H. L. Edinger, Barnet Foundry & Machine Co., Irvington, N. J.; secretary (re-elected), Robert G. Schaefer, Schaefer-Goodnow Foundries, Inc., Pittsburgh; and treasurer (re-elected), Henry J. Trenkamp, Ohio Foundry Co., Cleveland. Raymond L. Collier was reappointed GIFS executive vice-president.

The Society recently announced that its 1949 *Directory of Members* is now available for purchase by non-member foundries. Largest in Society history, the 80-page directory contains data on 540 gray iron foundries in the United States and Hawaii.

International Foundry Technical Dictionary Committee Established

COORDINATION of works of contributing nations for a proposed international foundry technical dictionary will be undertaken by a committee formed during the recent International Foundry Congress in Amsterdam, The Netherlands. Headed by Mario Olivo, president of the Italian Foundrymen's Association, the committee consists of representatives of eight nations: Vincent Delport (United States); D. H. Wood (Great Britain); Marcel Ballay (France); R. Deprez (Belgium); K. Gierdziejewski (Poland); M. F. Pisek (Czechoslovakia); and F. W. E. Spies (The Netherlands). Permanent headquarters of the committee has been established at Via Tonale No. 9, Milan (511) Italy.

MAGNESIUM IN IRON DETERMINED BY MERCURY CATHODE METHOD

A. E. La Rochelle, Chemist
and
J. A. Fournier, Chief Chemist
Bureau of Mines
Ottawa, Canada

Addition of magnesium to cast iron for the purpose of desulphurizing and effecting a nodular structure has presented a difficult chemical problem. It is necessary to estimate within narrow limits the true value of the retained magnesium.

As the standard methods did not meet these requirements, work was undertaken in these laboratories in the development of a method or methods which would meet them. Such a procedure was finally worked out to give the necessary accuracy and to meet the demands of the engineers.

Analysis Method Outlined

The method as now used at the Bureau of Mines is as follows: weigh 10 grams of the sample into a 600-ml beaker and add 50 ml of water. Dissolve the iron by careful addition of nitric acid, about 50 ml being needed. When the iron has dissolved add 75 ml of hydrochloric acid and evaporate to dryness. Add 50 ml of hydrochloric acid and then heat until all of the soluble salts are dissolved. Add 100 ml of water and filter the solution through a 41H Whatman paper. Wash thoroughly with a 5 per cent hydrochloric acid solution. (This procedure removes the silica and the graphitic carbon.)

Evaporate the filtrate to 30 ml and transfer the solution to a separatory funnel. Wash the beaker with 25 ml of concentrated hydrochloric acid and complete the transfer with 1:1 hydrochloric acid from a wash bottle, using a pressure bulb. Add 150 ml of ether, shake well and allow to settle. Draw off the acid layer and add 15 ml of 1:1 hydrochloric acid. Again shake and settle, drawing off the acid layer as before. Discard the ether extraction and return the acid extracts to the separatory funnel. Repeat the extraction with 75 ml of ether.

Add 10 ml of 1:1 sulphuric acid to the acid extract and evaporate to dense fumes. (This evaporation must be carefully performed as the acid extract always contains residual ether.) Cool and add 50 ml of water. Boil until the soluble salts are all in solution. Cool and reduce the acidity with ammonia until the precipitate that forms just redissolves. Transfer the solution to a mercury cathode cell and electrolyze until any remaining iron and other alloying elements, with the exception of manganese, titanium, aluminum, and vanadium, are deposited.

Table 1—Magnesium Recoveries on Synthetic Solutions

Magnesium Added, milligrams	Per Cent Magnesium, 10-gram sample	Magnesium Recovered: With Mercury Cathode, milligrams	With Mercury Cathode, per cent	Without Mercury Cathode, milligrams	Without Mercury Cathode, per cent
None	None	0.04	0.0004	0.10	0.001
2	0.02	2.01	0.020	1.58	0.016
5	0.05	4.69	0.047	4.40	0.044
10	0.10	9.24	0.092	9.16	0.092

Transfer the solution to a 400-ml beaker and boil. Add 10 grams of ammonium chloride and make alkaline with ammonia, then add 5 grams of ammonium persulphate and boil for 5 min. If the solution becomes acid add more ammonia. Filter and wash with a 1 per cent ammonium chloride solution made just alkaline with ammonia. If the magnesium is considered to be high, dissolve the precipitate and reprecipitate.

Bureau of Mines chemist makes determination of magnesium in cast iron by the mercury cathode method.

Combine the filtrates and acidify with hydrochloric acid. Heat to boiling to drive off the excess ammonium persulphate. Add 10 ml of ammonium oxalate and make just alkaline to methyl red with ammonia. Digest at 60 C for 30 min. Should a precipitate form, filter, and wash well with hot water. Cool the filtrate and add 25 ml of a 10 per cent solution of di-ammonium phosphate. Stir vigorously until the precipitate forms. Allow to stand overnight, then filter and wash thoroughly with a 5 per cent solution of ammonia. Dry and ignite until the residue is pure white. Cool and weigh the magnesium pyrophosphate.

$$\text{Weight} \times 10 \times 0.2184 = \text{per cent Mg}$$

Should a mercury cathode not be available, the step involving the use of this apparatus may be omitted, but the results for magnesium will not be as reliable

due to the interference of other alloying elements present, such as nickel, etc. When the mercury cathode is not used, omit the addition of sulphuric acid. Boil off the ether in the acid extract and proceed with the ammonium persulphate separation.

In order that the effect of the use of the mercury cathode on recoveries of magnesium might be determined, synthetic samples were made up using Bureau of Standards Cast Iron No. 6 with known additions of magnesium solution. Results are given in Table 1.

It will be noted that with the use of the mercury cathode there is a fairly uniform loss of about 8 per cent of the magnesium added, while this loss is greater when the use of the mercury cathode is omitted.

Typical duplicate checks obtained on various samples are given in Table 2, and in Table 3 are given

TABLE 2—DUPLICATE RESULTS ON NODULAR IRON SAMPLES

Sample No.	Magnesium Content, per cent	
816	0.013	0.013
835	0.043	0.042
837	0.048	0.046
838	0.036	0.037
839	0.036	0.037
828	0.045	0.041
829	0.074	0.074
830	0.004	0.004
831	0.022	0.020

TABLE 3—CHEMICAL AND SPECTROGRAPHIC DETERMINATION ON NODULAR IRON SAMPLES

Sample	Magnesium Content, per cent	
No.	Chemical	Spectrographic
117	0.052	0.053
118	0.023	0.025
119	0.020	0.026
120	0.054	0.045
121	0.113	0.099
122	0.055	0.059
123	0.023	0.023

checks between the wet method and the spectrographic method. Details of the spectrographic technique will be published at a later date. It is evident from the data in these tables that excellent duplication of results has been obtained.

Using the results of magnesium determinations by the foregoing method, good correlations have been obtained between the magnesium content and the microstructure and mechanical properties of nodular irons when the effect of the sulphur content is taken into account, as described by J. E. Rehder in the Sept., 1949, issue of AMERICAN FOUNDRYMAN.

Acknowledgment

This article is published by permission of the Acting Director, Mines, Forests and Scientific Services Branch, Department of Mines and Resources, Ottawa, Canada.

BADGER STUDENTS, CHAPTER HOLD JOINT MEET

COOPERATION between industry and education was the theme of a joint meeting between members of the A.F.S. Wisconsin Chapter and metallurgical students and faculty of the University of Wisconsin, meeting December 8 on the campus at Madison.

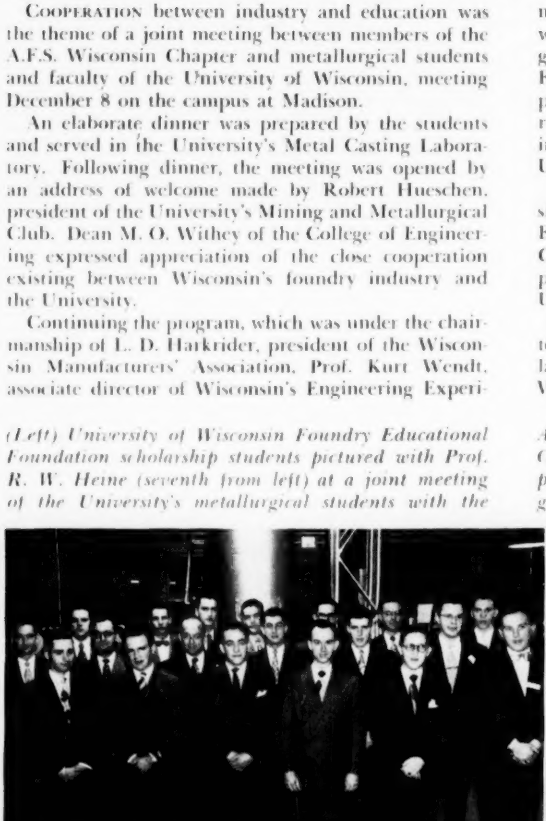
An elaborate dinner was prepared by the students and served in the University's Metal Casting Laboratory. Following dinner, the meeting was opened by an address of welcome made by Robert Hueschen, president of the University's Mining and Metallurgical Club. Dean M. O. Withey of the College of Engineering expressed appreciation of the close cooperation existing between Wisconsin's foundry industry and the University.

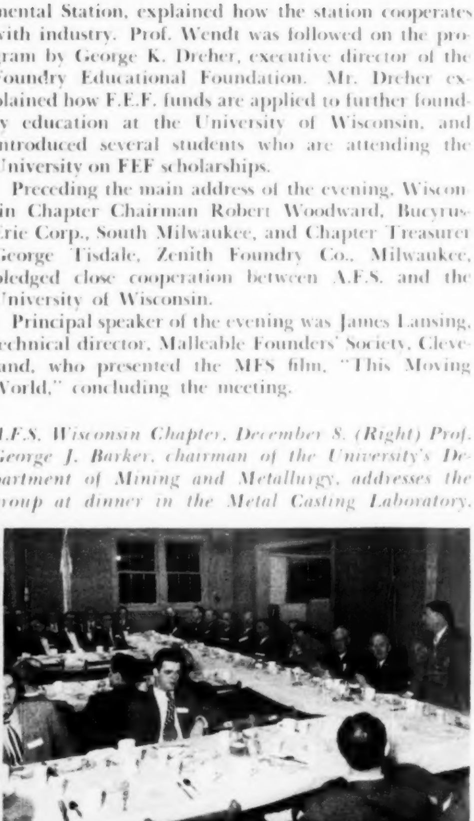
Continuing the program, which was under the chairmanship of L. D. Harkrider, president of the Wisconsin Manufacturers' Association, Prof. Kurt Wendt, associate director of Wisconsin's Engineering Experimental Station, explained how the station cooperates with industry. Prof. Wendt was followed on the program by George K. Dreher, executive director of the Foundry Educational Foundation. Mr. Dreher explained how F.E.F. funds are applied to further foundry education at the University of Wisconsin, and introduced several students who are attending the University on FEF scholarships.

Preceding the main address of the evening, Wisconsin Chapter Chairman Robert Woodward, Bucyrus-Erie Corp., South Milwaukee, and Chapter Treasurer George Tisdale, Zenith Foundry Co., Milwaukee, pledged close cooperation between A.F.S. and the University of Wisconsin.

Principal speaker of the evening was James Lansing, technical director, Malleable Founders' Society, Cleveland, who presented the MFS film, "This Moving World," concluding the meeting.

(Left) University of Wisconsin Foundry Educational Foundation scholarship students pictured with Prof. R. W. Heine (seventh from left) at a joint meeting of the University's metallurgical students with the A.F.S. Wisconsin Chapter, December 8. (Right) Prof. George J. Barker, chairman of the University's Department of Mining and Metallurgy, addresses the group at dinner in the Metal Casting Laboratory.





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OUTSIDE OF CHAPTER

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Cuba

Stewart Mac Farlane, Vice-Pres., Fundicion Mac Farlane, S. A., Sagua La Grande, Cuba.

ALL-MECHANICAL SHAKEOUT UNIT DESIGNED

Many mechanized foundries have experienced difficulty in handling molding flasks and castings at the shakeout station. Molds are made on machines, placed on conveyors, assembled, poured from monorail ladles, and then proceed by conveyor to the shakeout where two or more men are required to handle them.

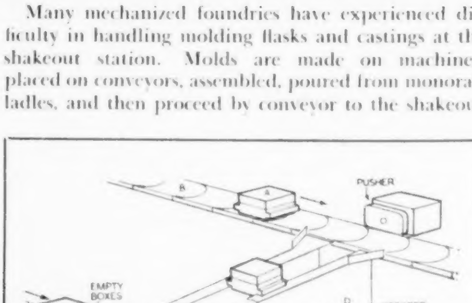

Diagram of the mechanical shakeout unit.

Many variations have been devised to suit the conditions in particular foundries, but most involve manhandling of the filled molds. In some cases the shakeout merely empties the flasks, the separation of the casting from the sand requiring a further operation.

To overcome these difficulties a shakeout unit which incorporates an electromagnetic vibrator has been developed by British Railways for its mechanized brake-block plant, as described in *Iron and Steel*, Aug., 1949.

The accompanying diagram shows the arrangement of the unit. Molding flasks (A) come from the pouring station on the mold conveyor (B) and are transferred by the pneumatic pusher (C) to the vibrating shakeout (D). Here they are positioned on the trough of the vibrator by means of the guide strips, which also serve as a protection against wear of the bottom face of the flask.

The sand and castings fall from the flasks on to the grid of the trough mounted on the vibrator, the sand falling through the grid to the return sand belt (E), the castings traveling forward along the grid to conveyor (F) which discharges them into skips attached to the cooling conveyor. The flasks, which are positioned on the trough by means of guide strips, travel to conveyor (G) for return to the molding machines.

Foreman Training Manual Published By American Foundrymen's Society

Improving the supervisory effectiveness of first-line foremen is the object of Guide for Foreman Training Conferences, new A.F.S. publication now available. The manual stresses the human relations characteristics that are of paramount importance to successful, everyday, sound employee-management relationships and brings out the economics of the free enterprise system.

For convenience, the material is divided into four parts:

1. Tips for the Conference Leader in Conducting a Conference.
2. Basic Economics.
3. Effective Leadership.
4. Methods Improvement.

A set of questions and answers appended to each conference outline helps spark discussion.

The 128-page, 8½ x 11 in. manual was developed and approved by Donald F. Lane, formerly with Bethlehem Steel Co., Sparrows Point, Md., and the A.F.S. Educational Division's Foreman Training Committee. Now director of training, Lever Brothers Co., New York, Mr. Lane is chairman of the committee. Other members at the time the manual was prepared were: Alexander C. Andrew, American Locomotive Co., Schenectady, N. Y.; T. J. Foster, Bethlehem Steel Co.; Steven G. Garry, Caterpillar Tractor Co., Peoria, Ill.; W. E. George, Booz, Allen & Hamilton, Chicago; William F. Graden, Simonds Abrasive Co., Philadelphia; B. A. Hodapp, National Association of Foremen, Dayton, Ohio; A.F.S. National President E. W. Horlebein; Fred W. Hurt, Lynchburg Foundry Co., Radford, Va.; G. J. Leroux, National Malleable & Steel Castings Co., Cleveland; B. A. Miller, Baldwin Locomotive Co., Philadelphia; Lloyd R. Walker, then with Wilson Foundry & Machine Co., Pontiac, Mich.; and National Director A. C. Ziebell, Universal Foundry Co., Oshkosh, Wis.

Guide for Foreman Training Conferences can be obtained from the American Foundrymen's Society, 222 W. Adams St., Chicago 6, Ill., at $1.50 per copy for Society members, and $2.25 for non-members.

FEF Issues Directory of Students Now Available For Foundry Work

Students currently completing foundry courses at accredited engineering schools throughout the country and who are or will be available for positions in the foundry industry are listed in a folder published December 1 by the Foundry Educational Foundation. For the most part veterans of World War II, these students are classified as to whether they are FEF scholarship students, students who have elected extracurricular foundry courses at FEF schools, or regular engineering students.

Such data as previous experience, military service, age, marital status, date of availability, and job preference are listed for each student. Firms desiring a copy of "Directory of Engineering Students Graduating and Available in December, January and February, 1950" are requested to write George K. Dreher, Executive Director, Foundry Educational Foundation, Terminal Tower Bldg., Cleveland 13, Ohio.

Twin City Bowlers Open '50 Season

In its third year, the A.F.S. Twin City Chapter's Bowling League is now well into its 35-week schedule. Made up exclusively of foundrymen, the League has eight teams representing Minneapolis-St. Paul area foundries: Pufahl Foundry, Inc.; National Foundry; J. F. Quest Foundry Co.; Minneapolis Electric Steel Casting Co.; Nick Helm Sand Co.; Prospect Foundry

Co.; Smith System Foundry and Crown Iron Works, current league leader, according to Walter Sexton, Prospect Foundry Co., Minneapolis, league secretary. Photo is by M. E. Seaquist, Pufahl Foundry, Inc., photographer for the Twin City Chapter.

Chicago Chapter Presents Six A.F.S. Memberships To Foundry Teachers

Continuing a phase of educational work started earlier this year, the Chicago Chapter of A.F.S. presented memberships in the Society to six foundry instructors of the Chicago school system at the chapter meeting November 7. Instructors honored were J. W. Anderson, Lindblom High School, George A. Davis, Crane Technical High School, John F. Dix, Austin High School, R. L. Drdla, Schurz High School, Paul F. Hoffman and Joseph S. Turek, both of Tilden Technical High School. Presentation was made by Prof. Roy W. Schroeder, Navy Pier Branch of the University of Illinois, Chicago, chairman of the Chicago Chapter Educational Committee and former foundry instructor in Chicago schools.

On June 13, Chicago Chapter Chairman W. D. McMillan, International Harvester Co., presented A.F.S. memberships to Howard W. Smith, supervisor of forge, foundry and welding, Chicago Board of Education, and the following Lane Technical High School instructors: Thomas J. Brown, Fred H. Dix, Charles E. Roland, and L. L. Sutherland. Presentation was made at a meeting of the Chapter Educational Committee in the office of Lane Principal James H. Smith.

WHO'S WHO

Bruce L. Simpson, author of "*Castings Can Do It Better,*" Page 34, is president of the National Engineering Co., Chicago . . . Himself a Past National Director of A.F.S., he is the son of A.F.S. Past National President Herbert L. Simpson and grandson of Peter L. Simpson, pioneer foundryman and inventor in whose honor the A.F.S. Simpson Gold Medal is presented outstanding foundrymen . . . Bruce Simpson is well known to the foundry industry as author of DEVELOPMENT OF THE METAL CASTINGS INDUSTRY and for his frequent appearances as a speaker at A.F.S. chapter meetings.

B. L. Simpson

Norman A. Birch is chairman of the A.F.S. Gating & Risering Committee, whose report, "*Triple Groove Sheave Casting Presents Rigging Problems,*" Page 25, gives results of a survey to find how different foundries would gate a test casting . . . Mr. Birch is division metallurgist for the American Brake Shoe Co.'s National Bearing Div., Meadville, Pa. . . . A graduate of M.I.T., Mr. Birch was in military service from April, 1942, to October, 1945 . . . He has been a frequent speaker before A.F.S. chapters.

N. A. Birch

Philip C. Rosenthal, author of "*Basic Principles Common to Foundry Melting Practices,*" Page 48, is associate professor, College of Engineering, University of Wisconsin . . . Holder of a degree in metallurgical engineering from that institution (1935), Mr. Rosenthal was for a time research engineer at Battelle Memorial Institute, Columbus, Ohio . . . He returned to his alma mater as an instructor in metallurgy, receiving his M.S. in 1939 . . . In 1941, he returned to Battelle as assistant supervisor of process metallurgy . . . Since 1945, Mr. Rosenthal has been an associate professor at the University of Wisconsin.

P. C. Rosenthal

Marvin W. Williams, author of "*Modern Foundry Methods,*" Page 44, is foundry manager for the Hughes Tool Co., Houston, Texas . . . A mechanical engineering graduate of the University of Texas, he joined Hughes Tool Co.'s sales department in 1935 . . . Mr. Williams is Immediate Past Chairman of the A.F.S. Texas Chapter and a member of the SFSA, ASM and the San Jacinto Chapter of the Texas Society of Professional Engineers.

M. W. Williams

J. A. Fournier, co-author with A. E. LaRochelle of "*Magnesium and Iron Determined by Mercury Cathode Method,*" Page 65, is chief chemist of the Canadian Bureau of Mines, Ottawa, Ont., where he is in charge of chemical laboratories for the entire Bureau . . . A graduate of Queen's University, Kingston, Ont., Mr. Fournier served overseas with the Canadian Army Engineers from 1915 to 1919 . . . He has since been with J. T. Donald Co., Montreal (1919-1925), Mond Nickel Co. (1926-1929), International Nickel Co. (1929-1937), and since 1937 has been chief chemist for the Bureau.

J. A. Fournier

A. E. LaRochelle, co-author of "*Magnesium and Iron Determined by Mercury Cathode Method,*" Page 65, has been with the Canadian Bureau of Mines since 1926, where he has had wide experience in analyzing ores, minerals and metals . . . Since 1942 he has specialized in ferrous and non-ferrous alloys. Recognizing the need for an accurate and reproduceable method for determination, the Bureau assigned Mr. LaRochelle to study the problem early in 1949. The results of his investigations are described in the story on page 65.

A. E. LaRochelle

Richard M. Landis, author of "*Radiography in the Steel Foundry,*" Page 58, is sales engineer for the General Electric X-Ray Corp., Cleveland . . . Born in Tryon, N. C., Mr. Landis attended the Tri-State College of Engineering, receiving his degree in 1934 . . . He joined the General Electric Co., Schenectady, N. Y., the following year as a test man . . . In 1936, Mr. Landis joined the General Electric X-Ray Corp., Milwaukee and Chicago, as an industrial x-ray application engineer, and in 1948 became sales engineer at the company's Cleveland headquarters.

R. M. Landis

E. F. Chittenden, author of "*Let's Pretend,*" Page 37, is director of industrial relations for the Unitcast Corp., Toledo, Ohio . . . Blinded by an accident, Mr. Chittenden spent several agonizing weeks not knowing whether he would ever see again . . . His experiences served as the foundation for the copyrighted industrial safety program, "*Let's Pretend,*" on which he collaborated with George Zang, Unitcast's director of safety and training . . . "*Let's Pretend*" is available to interested organizations either in transcribed form or as a personal appearance demonstration by Messrs. Chittenden and Zang . . . Further information is available by writing "*Let's Pretend,*" 959 Spitzer Bldg., Toledo . . . Mr. Chittenden left Albion College in 1917 to enter the Army as a Lieutenant of Field Artillery . . . After his discharge he took up sales training work, serving as sales training director for a number of organizations before starting his own company, the Depolonizer Co., manufacturing air conditioning equipment for the relief of hay fever sufferers . . . Mr. Chittenden

E. F. Chittenden

later became president of the Paper Packages Co., Toledo, leaving there to serve as a major in the Air Force during World War II . . . He has been director of industrial relations for Unitcast Corp. since shortly after his discharge in 1944.

G. A. Zang

George A. Zang, who with E. F. Chittenden conceived the *"Let's Pretend"* demonstration described on Page 37, is director of safety and training for the Unitcast Corp., Toledo . . . For many years a vaudeville performer and a leading man in several theatrical stock companies, Mr. Zang was quick to realize the dramatic value of Mr. Chittenden's experiences with blindness, and together they formulated the industrial eye safety program, *"Let's Pretend"* . . . Mr. Zang's colorful career has also included service in World War I, two years as a Treasury agent, ownership of his own private detective agency, and six years' service as deputy sheriff of Lucas County, Ohio.

Connecticut Non-Ferrous Foundrymen Meet

FEATURED TALK at the November 16 meeting of the Connecticut Non-Ferrous Foundrymen's Association, held at the Castle Restaurant, New Haven, Conn., was *"Air Tools and the Air Power Story,"* given by John G. Lutz of the Ingersoll-Rand Co.

Productivity of industry, Mr. Lutz said, can be materially increased with better tools and their intelligent use. Air tools are particularly important because they produce more power per pound of weight than other types, the speaker said.

Mr. Lutz cited several examples and produced charts to prove that air power tools frequently pay for themselves in increased production within eight days to three months, at the same time lightening labor effort.

During the last few years, Mr. Lutz said, wages have increased 118 per cent but air tools have increased in price only 45 per cent since 1939. This new relationship between the cost of labor and air tools has created new fields of application for air tools, the speaker added.

Mr. Lutz concluded his talk by stating that raising of air pressures from 70 to 90 lb results in a 37 per cent increase in efficiency. Following the talk, discussion centered on use of air peening tools on small squeezer molding machines.

NEFA Holds November Meet

NOVEMBER MEETING of the New England Foundrymen's Association, held November 9 at the Engineers' Club, Boston, featured a talk by John R. Crotty, Crompton & Knowles Loom Works, Worcester, Mass., on *"Electronic Baking of Cores."*

Mr. Crotty described electronic core baking installations at his foundry in detail and outlined processes employed. His talk covered the subject thoroughly and provoked a lively discussion period.

A. F. S. CHAPTER DIRECTORY

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FOUNDRY *Personalities*

Justin T. Morgan, until this spring a member of the A.F.S. Oregon State College student chapter, has been appointed tool engineer for the Boeing Aircraft Co., Seattle, Wash. Mr. Morgan's previous business experience includes periods as a draftsman with Lockheed Aircraft Co., and as tool engineer with Kinney Motors and Way Engineering Co., all of California.

Eugene P. Berg has been named assistant general manager of the Link-Belt Co.'s Pershing Road, Chicago, plant and **Richard Moyer** general superintendent of the company's manufacturing department. Mr. Berg has been with Link-Belt since 1929 and was formerly general superintendent. Mr. Moyer has been with the company since 1937 and was formerly superintendent of the steel shop. Other appointments include those of **Stanley F. Zale** as superintendent of the steel shop; **Ray Witt** as supervisor of the time study and methods department; and **Harold Hartman** as chief inspector of the Pershing Road Plant.

Milton L. Huemme has been named manager of coke sales for the Diamond Alkali Co., Cleveland. Mr. Huemme has been with Diamond for 22 years and has spent most of that time in coke sales. He attended Douglas Business College and the Carnegie Institute of Technology and is a member of the American Foundrymen's Society.

W. J. MacNeill, assistant to the president of the Dayton Malleable Iron Co., Dayton, Ohio, and a National Director of

W. J. MacNeill

the American Foundrymen's Society, has been "loaned" by Dayton Malleable to the Foundry Educational Foundation to help further FEF's campaign effort. Mr. MacNeill will work through local FEF campaign chairmen and among certain Special Gifts prospects.

Chain Belt Co., Milwaukee, announces the election of **William J. Sparling** as vice-president and manager of its Chain & Transmission Div. Mr. Sparling joined Chain Belt in 1928 as a student engineer and has since been, successively, head of the company's metallurgical laboratory, assistant to the chief engineer of the Chain & Transmission Div., assistant works manager and works manager. Mr. Sparling is succeeded as works manager by **E. P. Meyer**, assistant works manager. **Roscoe O. Byers** has been appointed factory manager of the Chain & Transmission Div., and **Clarence B. Ringham** factory manager of the Heavy Machinery Divs. **George B. Flanigan** is the new manager of Trade Relations.

Earl W. Pughe has joined the Wheland Co., Chattanooga, as manager, Manufacturing Division, which includes the design and production of Wheland oil field drilling equipment and sawmill machinery. Mr. Pughe, has had more than 30 years' experience as a production executive, in-

E. W. Pughe

cluding 22 years spent with the Chevrolet Div., General Motors Corp., and management of three of its plants. Immediately prior to joining Wheland, Mr. Pughe was assistant to the president, Dana Corp., Toledo, Ohio. He is a graduate of Rensselaer Polytechnic Institute and a veteran of World War I.

Margaret L. Steele, R. N., has been named superintendent of nurses for the American Brake Shoe Co. Mrs. Steele, who first joined Brake Shoe in 1913, has been serving as industrial nurse at the St. Louis plant of the company's American Manganese Steel Div. A graduate of Simmons College, Boston, Mrs. Steele is president of the St. Louis Industrial Nurses Club and a member of the American Association of Industrial Nurses.

Robert W. Clyne succeeds **Armand H. Peycke** as manager of the Passenger, Locomotive and Industrial department of the Railway Sales Div., American Steel Foundries, Chicago. Mr. Clyne was formerly assistant vice-president. Mr. Peycke has retired after 37 years with the company, but will continue in the capacity of consultant to the company.

Harry S. Thompson has been named general works manager for the American Furnace & Foundry Co., Milan, Mich. Formerly a member of the foundry management engineering firm of George H. Elliott & Co., Mr. Thompson has supervised a number of foundry expansion and mech-

H. S. Thompson

anization programs throughout the country. As general works manager for American Furnace's Milan foundry, he will supervise production of gray iron castings for the automotive, tractor, laundry equipment, heating and tool industries.

W. M. Buckholtz, formerly with the Auburn Foundry Co., Auburn, Ind., succeeds the late C. F. Armstrong as foundry superintendent, Lynch Corp., Anderson, Ind.

Philip Baxendale of Richard Baxendale & Sons, Chorley, Lancashire, England, was a recent visitor to the A.F.S. National Office. Mr. Baxendale, whose firm manufactures furnace and fireplace equipment, is visiting foundry installations of heating equipment manufacturers in this country.

R. Ewart Stavert of Montreal, president of the Consolidated Mining & Smelting Co. of Canada, Ltd., has been named a director of the International Nickel Co. of Canada.

William A. Casler, research engineer for the Armour Research Foundation of the Illinois Institute of Technology, has been

appointed assistant director of research, to be in charge of stimulating new fields of research for the Foundation.

Vernon L. Mattson, since 1944 chief engineer of the Consolidated Feldspar Corp., Trenton, N. J., has been appointed director of the Colorado School of Mines Research Foundation, organized early this year as a non-profit organization to promote research and development in all types of mineral industry work. Mr. Mattson is a graduate of the Colorado School of Mines and attended the Carnegie Institute of Technology. Since graduation, he has been in the industrial minerals field.

V. L. Mattson

Stuart M. Phelps, a Senior Fellow of the Mellon Institute and director of research and tests for the American Refractories Institute, has been named recipient of the 1950 Albert Victor Bleininger Award of the American Ceramic Society for "distinguished achievement in ceramics."

John E. Harris has been named technical advisor to B. T. Hain, vice-president for manufacturing, National Radiator Co., Johnstown, Pa. Mr. Harris will handle technical problems and developments involving manufacturing processes at the company's plants in Johnstown, New Castle and Middletown, Pa., and Trenton, N. J. A graduate of Wittenberg College, Mr. Harris joined National Radiator in 1943. He had formerly been superintendent of the Electrode Div., McKay Co., York, Pa.

J. Robert Bunch has been appointed sales representative to assist J. D. Alexander in the Cleveland office of the American Wheelbrator & Equipment Corp.

Richard B. Ballmann, formerly a member of the A.F.S. Missouri School of Mines student chapter, is now employed by the Central Foundry Division, General Motors Corp., Danville, Ill.

Craig R. Shaeffer has been elected a director of Keokuk Electro-Metals Co., Keokuk, Iowa, according to Company President G. L. Weissenburger. Mr. Sheaffer is president and a director of the W. A. Sheaffer Pen Co., and has been actively associated with civic organizations.

Verne H. Schnee, formerly assistant director of Battelle Memorial Institute, Columbus, Ohio, has been named director of the University of Oklahoma Research Institute, Norman, Okla. A chemistry graduate of Cornell University, Mr. Schnee was chairman of the Products Research Division, War Metallurgy Committee, National Research Council during World War II, and was later appointed chairman of the Committee on Ship Construction of the Division of Engineering. Mr. Schnee is the first full-time chairman of the University of Oklahoma Research Institute.

V. H. Schnee

J. A. Arter has been named assistant general manager for Ampco Metal, Inc., Milwaukee. Mr. Arter was formerly staff assistant to the general manager.

Cecil R. Pond has been named Alabama and Northwestern Florida sales representative for the Automatic Transportation Co.

A. P. De Vita, formerly foundry production manager, Robins Conveyor Divisions, Hewitt-Robins, Inc., New York, has been appointed New York district sales manager for the company.

Wayne Karber will head sales of cast stainless steels for William G. Boales & Associates, Detroit manufacturers' representatives for Cooper Alloy Foundry Co.

Alex Zuk, formerly with the Westinghouse Electric Corp., Pittsburgh, has been appointed sales engineer for Laclede-Christy Co.'s Arch and Wall Div.

L. H. Perry, formerly mechanical engineer with James Leffel & Co., Springfield, Ohio, has been appointed head of the Hydraulic Dept., Holyoke Machine Co., Holyoke, Mass.

Thomas D. Jolly, vice-president in charge of engineering and purchases for the Aluminum Co. of America, was re-elected president of the American Standards Association October 11 in New York.

Ward A. Miller, a director and vice-president of the Vanadium Corp. of America, New York, has been assigned to coordinate and administer the company's sales and technical divisions.

Nils Anderson, Jr., vice-president of the Chemical Div., Borden Co., New York, has been appointed vice-president of Debevoise-Anderson Co., New York, of which his father is president and a founder. Mr. Anderson during the war was chief of the Adhesive Unit of the Office of Production Management and later chief of the Plastics Section of the War Production Board's Chemical Bureau. He joined Borden in 1935 as vice-president of the company.

Personnel changes recently announced by the Hyster Co., Portland, Ore., are: **John Mitchell,** to be Northeastern district manager of truck sales; **John Cusick,** to be lift truck sales manager, central district; **W. J. O'Brien,** to be southwestern district sales manager; **C. E. Houston,** to be northwest district sales manager; and **Fred Schultz,** to be southeastern district sales manager for the company.

James J. Larson has been appointed superintendent of foundries, Yonkers Works, Otis Elevator Co., Yonkers, N. Y. He succeeds Walter Stansfield, who died April 21.

R. A. J. Wellington has been named national sales manager of Precision Metalsmiths, Inc., Cleveland, Ohio. Mr. Wellington, who has been in charge of Precision's home office sales since 1945, served as manager of the Cleveland Branch of the Office of Production Management during World War II. A graduate of Worcester Polytechnic Institute, Mr. Wellington served as a Captain overseas in World War I.

William E. Madden, newly-elected vice-president of the George Haiss Mfg. Co., Inc., New York, division of the Pettibone Mulliken Corp., has been named general sales manager of Haiss.

OBITUARIES

Charles E. Schley, 66, founder and chairman of the Board of Directors of the Philadelphia Brass & Bronze Corp., died December 9 at his home in Ocean City, N. J. Mr. Schley, a member of the A.F.S. Philadelphia Chapter, was for many years a national director of the Non-Ferrous Founders' Society and a member of that organization's Executive Committee.

Alvin G. Raddatz, vice-president of the Lakeshore Machinery & Supply Co., Muskegon, Mich., died November 2. Mr. Raddatz was a member of the A.F.S. Western Michigan Chapter.

Oscar W. Swangren, 61, owner of the Dorchester Brass & Aluminum Foundry, Dorchester, Mass., died October 25 in Boston. Born in Sweden, Mr. Swangren served his foundry apprenticeship in that country and came to this country in 1902. He acquired Dorchester Brass & Aluminum in 1914. Mr. Swangren was for several years a national director of the Non-Ferrous Founders' Society.

Virgile E. Bietry, president of the B & S Brass Foundry, Inc., Brooklyn, N. Y., died October 13.

Letters to the Editor

Letters to the Editor gives the foundry industry an open forum for the exchange of ideas, facts, opinions, and criticisms on anything related to the industry or of importance to foundrymen. All letters of broad interest which do not violate A.F.S. policy or good taste are publishable. Write to The Editor, American Foundryman, 222 W. Adams St., Chicago 6, Ill. Letters must be signed but will be published anonymously on specific request.

Society Members Help French Foundry Group

Now that the French Gray Iron Foundry Group has returned to France, I have the opportunity of reviewing our program which was indeed successful and in which you participated so prominently.

We are indebted to you and your associates for the assistance so generously given in connection with the arrangements for our itinerary in the Chicago area. The cooperation accorded the group can best be expressed in the words of Paul Chatelin of the Foundry Industries Technical Center, leader of the group. In addressing William C. Foster, deputy administrator of ECA, he said: ". . . because of the warm welcome we received everywhere, we are taking back with us not only a great deal of technical information but many unforgettable personal memories as well."

I feel certain the results of the visit to this country will remain for a long time in the hearts and minds of our French visitors.

Charles W. Kerwood
Econ. Coop. Admin.
Washington, D. C.

A.F.S. members in Chicago, Cleveland, Detroit, Milwaukee, and other foundry centers, and members of the Society's National Office staff, cooperated in planning the six-week visit and in giving technical talks and opening plants for visitation and study. —Editor.

Service Is An A.F.S. Watchword

My thesis on *"The Economics of Foundry Patterns"* has just been completed successfully. I should like you to accept my sincere thanks for your valuable assistance, and for your exceptional courtesy and interest. The American Foundrymen's Society was the only organization in the United States and Canada which considered it worth while to make more than a perfunctory effort on my behalf.

B. E. Moore
Toronto, Ont.

Hope To Exchange Ideas With A.F.S. Members

The articles by E. J. McAfee which appear now and then in American Foundryman are very helpful to patternmakers and I hope you will continue them.

I am a young Spanish patternmaker, age 27, and have tried to travel to improve my knowledge of the trade. The only contact I have with foreign methods is through American, French, and British publications which are useful but expensive. I should like to learn more about modern methods of patternmaking as practiced in the United States and I am wondering if you could possibly put me in contact with patternmakers who would like to correspond with me.

I. Balada, *Modelista*
Salamanca 1
Barcelona, Spain

Some time ago I received from the United States through my relatives the Handbook of Cupola Operation published by the American Foundrymen's Society. Being by profession the foreman of a foundry here, I am always trying to collect foreign books and magazines which deal with foundry practices and operations as there are no such special books or publications in Finnish. It is a great pleasure to find that at last I have a book for which I've been looking a long time.

Other foremen and I have studied the Cupola Handbook together and discussed the different problems we have in our daily work. Our self education has progressed so far that we are now interested in the references in the book in order to get more detailed information.

Import of foreign publications into Finland is not very great, especially from the United States, because of the lack of dollars. Therefore we decided in our last meeting to ask if it would be possible to obtain old copies of A.F.S. Transactions which seem to contain many interesting articles on foundry technology.

At the same time I invite foundrymen who are interested to carry on correspondence with me. I am sure it would lead to mutual satisfaction of both parties.

Alpo Olkkonen
Aleksis Kivenk. 56, B45
Helsinki, Finland

We are pleased to be able to publish these invitations to correspond on foundry and patternmaking problems and hope that a number of *American Foundryman* readers will respond with an exchange of information in the spirit of cooperation characteristic of members of the American Foundrymen's Society.

Mr. McAfee, master patternmaker of the Puget Sound Naval Shipyard, Bremerton, Wash., will have an article on a plastic pattern coating and a method for applying it in the February issue of "The Foundrymen's *Own* Magazine." —Editor.

More Names For New Iron

If it were not for certain differences in the physical and mechanical properties of the new magnesium and cerium treated

(Continued on Page 93)

Members of a French foundry team who recently toured United States foundries to study gray iron casting techniques under the auspices of the Economic Cooperation Administration and the French Ministry of Industry and Commerce are pictured here with company officials as they visited the Chicago Hardware Foundry Co. at North Chicago, Ill. The French foundry team comprised a group leader from the French foundry technical center, foundry owners, engineers, foundry foremen and production workers.

A few of the foundrymen who attended Metropolitan Chapter's Annual Christmas Party, held at the Essex House, Newark, N. J., Friday, December 9. (Photo by John Bing, Metropolitan Refractories Corp.)

CHAPTER ACTIVITIES NEWS

Eastern New York

G. E. Danner
American Locomotive Co.
Publicity Chairman

A LARGE GROUP attended the Chapter's November 15 meeting, held at the Circle Inn, Lathams, N. Y., to hear Franz Schumacher, Cooper Alloy Foundry Co., Hillside, N. J., give a talk and demonstration on *"Modern Techniques in Plastic Patternmaking."*

Mr. Schumacher brought with him a large selection of plastic patterns and discussed the techniques by which they were made. Following his talk, members brought up a number of specific problems in coremaking.

Metropolitan

Carl Szego
Moldcast Products, Inc.
Publicity Chairman

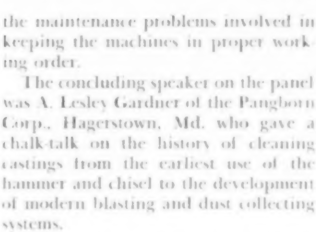
A PANEL MEETING on *"Care and Maintenance of Foundry Equipment"* was featured at the November 7 meeting, held at the Essex House, Newark.

The first speaker to be introduced by Technical Chairman Dan W. Talbot, Cooper Alloy Foundry Co., Hillside, N. J., was George B. Comfort of Schramm, Inc. Mr. Comfort discussed *"Compressors and Compressed Air"* in foundries, the importance of proper installation and maintenance of compressed air equipment in order to give long lasting and economical service under the adverse conditions in which they generally operate in the industry.

Raymond J. Shire of the Tabor Mfg. Co. next described the vital parts of various types of molding machines and the maintenance problems involved in keeping the machines in proper working order.

The concluding speaker on the panel was A. Lesley Gardner of the Pangborn Corp., Hagerstown, Md. who gave a chalk-talk on the history of cleaning castings from the earliest use of the hammer and chisel to the development of modern blasting and dust collecting systems.

A discussion period followed the talks in which members of the audience brought up specific maintenance and cleaning problems which have arisen in their foundries.



Part of the festive crowd attending the St. Louis District Chapter's Christmas Party on December 8.

British Columbia

W. R. Holeton
British Columbia Research Council
Chapter Secretary

A JOINT MEETING with the Metal Trades Section, Canadian Manufacturers' Association, and the Personnel Managers' Association, held in November, featured a talk by Ralph L. Lee, General Motors Corp., on *"Man to Man on the Job."* Both Mr. Lee and A.F.S. National Director Robert Gregg, Reliance Regulator Corp., Alhambra, Calif., were guests at a dinner meeting of the Chapter Executive Committee preceding the regular meeting.

The Chapter's Educational Course has just been completed under the leadership of Prof W. M. Armstrong, Department of Metallurgy, University of British Columbia, and it is hoped to continue the course next year.

Texas A & M College

J. W. Canning, Jr.
Chapter Reporter

FIRST ANNIVERSARY of the Texas A & M Student Chapter was celebrated December 9 with a banquet at the Oaks, Bryan, Texas. The regular meeting of the chapter was held in conjunction with the banquet.

Guests present included Jake Dee, Dee Brass Co., Houston; M. J. Henley, Texas Foundries, Inc., Lufkin, head of the Texas Chapter's Educational Committee and Industrial Advisor to the student chapter; Dean W. H. Barlow of the School of Engineering; and Texas Chapter Chairman C. R. McGrail, Texaloy Foundry Co., San An-

tonio; Chapter Secretary P. B. Croom, Houston Pattern Works, Houston; Chapter Vice-Chairman W. H. Lyne, Hughes Tool Co., Houston; John M. Bird, American Brass Foundry, Ft. Worth; and Faculty Members C. W. Crawford, M. W. Watson, D. W. Fleming and R. V. Jarvi.

C. R. McGrail congratulated the student chapter on completion of its first year of activity and extended wishes for a bright future. Following this, Student Chapter President Uvalde Stoermer outlined the chapter's activities during its first year. Robert Jones, senior engineering student, spoke on *"The Recently-Graduated Engineer's Place in the Foundry Industry."*

Dean Barlow of the School of Engineering discussed foundry education, and Faculty Advisor L. G. Berryman announced that a new foundry scholarship has been established by the Texas Chapter.

The meeting concluded with a showing of a film of the Texas A & M—Southern Methodist football game.

Talking things over at the November meeting of the Birmingham District Chapter were, left to right: Harry Mouatt and Speaker R. L. McIlvaine both of the National Engineering Co., Chicago, and Chapter Vice-Chairman Morris Hawkins of Stockham Valves & Fittings, Inc., Birmingham.

Ohio State University

Dallas M. Marsh
Publicity Chairman

DECEMBER 6 MEETING of the student chapter was marked by a malleable castings exhibit and by the showing of the malleable film, *"This Moving World."* Both were presented through the courtesy of the Lake City Malleable Co., Cleveland, and the Columbus Malleable Iron Co.

During the day, engineering students were shown through the bus which houses the exhibit. Officials of the two firms were present to answer questions concerning the wide assortment of malleable iron castings and photographs showing production techniques.

The film, which shows the processing and uses of malleable products, was presented during the chapter meeting by Charles A. Fowler, the Columbus Malleable Iron Co. Following a business discussion, humor was injected into the meeting with the awarding of the "distinguished service badge" to member John Eggleston. The award is given at each meeting to the member who has done the most in the preceding month toward furthering the aims of the chapter. At present several chapter members are voluntarily helping to overhaul an electric furnace to be used in Ohio State University's foundry laboratory.

Birmingham District

J. P. McClendon
Stockham Valves & Fittings, Inc.
Publicity Chairman

BIRMINGHAM FOUNDRYMEN have shown their enthusiasm for the Foundry Educational Foundation program at the University of Alabama by contributing $500 to be applied on the purchase of additional sand testing equipment. Chapter Chairman C. P. Caldwell, Caldwell Foundry & Machine Co. announced at the November meeting that the chapter Board of Directors had approved the gift and authorized payment of the sum.

Dr. F. C. Wright, head of Alabama's Department of Metallurgical Engineering was present at the meeting and expressed his appreciation to the Chapter for the gift and for the time and effort that members of the Educational Committee have spent in helping to get the F.E.F. program under way at the University. With the new building and up-to-date equipment already installed Alabama has one of the finest foundry courses that can be found, he said. Dr. Wright was accompanied to Birmingham by Robert Oliver, associate professor of metallurgy.

R. L. McIlvaine, National Engineering Co., Chicago, was introduced by E. M. Cranford, Stockham Valves & Fittings, as the speaker of the evening. His talk on *"Mechanization on the Installment Plan"* featured slides showing latest phases in foundry mechanization.

Part of the huge crowd attending the A.F.S. Philadelphia Chapter's Annual Christmas Party, held December 6 at the Benjamin Franklin Hotel.

Ontario

C. H. Johnston
E. Long, Ltd.
Chapter Director

PLANT VISITATIONS were held Friday morning and afternoon, December 2, preceding the regular chapter meeting at the Prince Edward Hotel, Windsor.

The following plants were open for visitations:

Michigan Steel Casting Co., Detroit; Sherwood Brass Co., Detroit; Auto Spe-

cialties, Ltd., Windsor; Bryant Pattern Works, Walker Metal Products Co., the Ford Motor Co. foundry, City Pattern Works foundry, Detroit; and the block machine shop of the Chrysler Motor Corp., Windsor.

Two group meetings were held following a dinner attended by 200 members and their guests.

The Non-Ferrous Group, headed by Chairman Harold Gray, Wallaceburg Brass Co., heard Harold Younger, Chicago Faucet Co., describe his plant's casting operations.

The Ferrous Group, led by Chairman Harold Gregory, Walker Metal Products, heard Robert B. Melmoth, Ford Motor Co., Dearborn, Mich., speak on "*Nodular Iron Development.*"

Guests attending the dinner were C. S. Parsons, chief, Bureau of Mines, Department of Mines and Resources, Ottawa, Ont.; Detroit Chapter Chairman R. J. Wilcox, Michigan Steel Castings Co.; Jess Toth, Harry W. Dietert Co., Detroit Chapter Vice-chairman; and A.F.S. Past National President Fred J. Walls, International Nickel Co.

A. W. Stolzenburg, Aluminum Co. of America, Detroit (left), retiring chairman of the Detroit Chapter, presents gavel to Incoming Chairman R. J. Wilcox, Michigan Steel Castings Co. at the December 2 meeting.

Northeastern Ohio

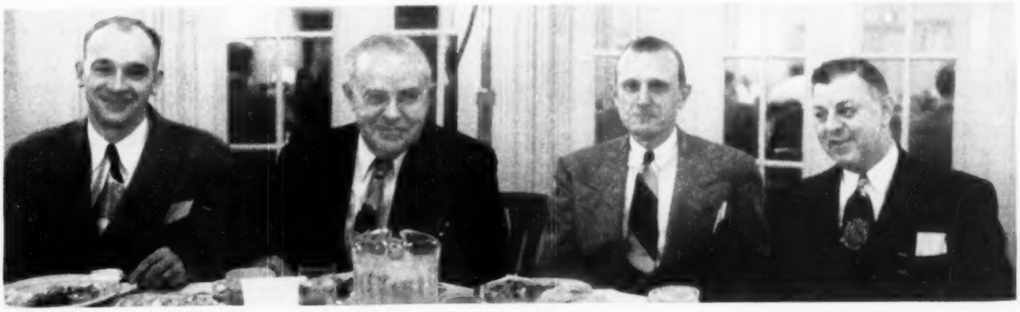
Robert H. Herrmann
Penton Publishing Co.
Chapter Reporter

EXCELLENT TURNOUT marked the November 10 meeting, held at the Tudor Arms Hotel, Cleveland. R. G. McElwee, Vanadium Corp. of America, Detroit, spoke on "*Application of Research to the Foundry Industry.*" His talk was followed by presentation of the Malleable Founders' Society's motion picture, "*This Moving World.*"

A.F.S. Convention and Exhibits Manager A. A. Hilbron made a brief announcement concerning the 1950 A.F.S. Foundry Congress and Show, to be held in Cleveland, May 8-12, 1950.

Mr. McElwee pointed out that while the term "research" usually brought to mind technicians and laboratories

Attending Texas Chapter's November 18 meeting, held in Dallas, were, left to right: Charles Sibbett, Refinery Castings Co.; Texas Chapter Chairman C. R. McGrail, Texaloy Foundry Co.; Speaker Clyde A. Sanders, American Colloid Co., Chicago; Chapter Vice-Chairman W. H. Lyne, III, Hughes Tool Co.; and C. W. Williamson, Trinity Valley Iron and Steel Co.



Speakers' table occupants at Northeastern Ohio Chapter's November meeting were, left to right: Chapter Vice-President Fred J. Pfarr, Lake City Malleable Co.; R. G. McElwee, Vanadium Corp. of America, Detroit, speaker; William G. Gude, Penton Publishing Co., Chapter President; and Alfred A. Hilbron, Convention & Exhibits Manager, A.F.S. Headquarters. (Photograph: Sterling Farmer, Sand Products Corp.)

with a large assortment of expensive equipment, to his mind it meant finding the cause of any effect; for example, what causes a certain type of defect in a casting?

On that basis every foundry should have a research program, he said, for it is important to be able to eliminate losses due to defects and other causes. However, one of the major obstacles in the effective application of a research program is management's reluctance to allow any activity to interfere with a planned production schedule. Yet it would seem to be unsound policy to operate with a 14 per cent loss, for example, when research for the cause of that loss in the midst of production activity might bring the loss down to reasonable limits.

Technical Chairman Linn Burk, International Harvester Co., Indianapolis, congratulates Speaker Eugene Conreaux, Illinois Cereal Mills, Paris, Ill., at the December 5 meeting of the Central Indiana Chapter. (Photograph courtesy International Harvester Co.)

He pointed out that someone not associated with production can determine causes of trouble quickly because of an unbiased viewpoint. Mr. McElwee urged that complete and accurate records be kept on various operations so that they can be checked when trouble arises. He also stated that foundries should sell the engineering properties of the product rather than so many pounds of castings.

In emphasizing the importance of slag composition as a factor in cupola control, Mr. McElwee stated that the A.F.S. Cupola Research Committee is available to assist foundries in problems connected with slag.

The speaker concluded his talk with a brief discussion of nodular iron. While expressing the opinion that potentialities of this material are tremendous, he recommended that any foundry not prepared to spend time and money in developing its practices for production of such castings should not consider it as a product. The purveyor of nodular iron castings requires not only research talent to make them but also engineers capable of selling the metal's properties.

The Patternmakers Group held a panel discussion. Questions for the discussion were submitted by apprentices in trade schools and shops from the local area. Apprentices were invited to attend the session.

Peter Rettig, Rettig Pattern Works, Cleveland, was panel chairman. Panel members included Carl Winkler, Cleveland Standard Pattern Works; Theodore Able, Advance Pattern Co.; Harry Schutt, Schutt Pattern Works, and Edward Glosner, Modern Pattern Co., all of Cleveland.

FUTURE CHAPTER

• JANUARY 16
QUAD CITY
Ft. Armstrong Hotel, Rock Island, Ill.
Harry Kessler
Sorbo-Mat Process Engineers
"Gates and Risers"

• JANUARY 18
CENTRAL MICHIGAN
American Legion Clubhouse, Battle Creek
B. P. Mulcahy
Fuel Research Laboratory, Inc.
"Foundry Coke"

• JANUARY 19
DETROIT
Rackham Memorial, Detroit
Thomas E. Barlow
Eastern Clay Products, Inc.
"Effect of Sand Variables on Scrap Losses or Good Castings from Bad Sands and the Reverse"

• JANUARY 20
WESTERN NEW YORK
Troop I Post, American Legion
Annual Stag Party

TRI-STATE
Tulsa, Okla.
Film: *"The Drama of Steel"*

WASHINGTON
Gowman Hotel, Seattle
J. E. Rehder
Canadian Bureau of Mines
"Nodular Iron"

BIRMINGHAM DISTRICT
Hotel Tutwiler, Birmingham
J. A. Wickett
Monsanto Chemical Co.
"Synthetic Resin as a Core Sand Binder"

TEXAS
Ft. Worth, Texas
S. C. Massari
A.F.S. Technical Director
Film: *"Fluid Flow in Transparent Molds"*

• JANUARY 23
NORTHWESTERN PENNSYLVANIA
Moose Club, Erie
Walter Bonsack
Apex Smelting Co.
"Non-Ferrous Problems"

• JANUARY 27
ONTARIO
Royal Connaught Hotel, Hamilton
Group Meetings

CHESAPEAKE
Engineers' Club, Baltimore
T. E. Eagan
Cooper-Bessemer Corp.
"Nodular Iron"

• FEBRUARY 1
TOLEDO
Toledo Yacht Club
"Material for Jet Engines"

• FEBRUARY 2, 3, 4
BIRMINGHAM DISTRICT
Tutwiler Hotel, Birmingham
Birmingham Regional Conference

• FEBRUARY 3
WESTERN NEW YORK
Sheraton Hotel, Buffalo
George Mau
Johnson-March Corp.
"Dust Control and Sand Conditioning"

• FEBRUARY 6
CENTRAL ILLINOIS
Jefferson Hotel, Peoria
James H. Smith
Central Foundry Div., GMC
"Future of the Foundry Industry"

CHICAGO
Chicago Bar Association
Film: *"Fluid Flow in Transparent Molds"*

METROPOLITAN
Essex House, Newark, N. J.
James H. Rickey
Ironton Fire Brick Co.
"Modern Foundry Refractories"

Western New York

Roger E. Walsh
Hickman, Williams & Co., Inc.
Chapter Reporter

Two sound films, presented through the courtesy of the Fanner Mfg. Co., Cleveland, were featured at the November 1 meeting, held at the Sheraton Hotel, Buffalo.

The films dealt with *"Uses of Foundry Chaplets and Chills"* and depicted their part in foundry operations.

Following showing of the films, Joseph H. Sanders, Tonawanda Electric Steel Castings Co., Tonawanda, N. Y., led a discussion of chaplets and chills.

MEETING PROGRAMS

● FEBRUARY 7
MICHIANA
LaSalle Hotel, South Bend, Ind.
Vaughan C. Reid
City Pattern Foundry & Machine Co.

● FEBRUARY 9-10
WISCONSIN
Schroeder Hotel, Milwaukee
Wisconsin Regional Foundry Conference

● FEBRUARY 10
PHILADELPHIA
Engineers' Club, Philadelphia
E. C. Troy
Foundry Consultant, Palmyra, N. J.
"Sand"

● FEBRUARY 13
CINCINNATI DISTRICT
Engineering Society, Cincinnati
William E. Johnson
Naval Research Laboratory
"Gating Systems for Castings"

CENTRAL OHIO
Chittenden Hotel, Columbus
Douglas C. Williams
Ohio State University
"Sand"

● FEBRUARY 14
ROCHESTER
Hotel Seneca, Rochester
Thomas E. Eagan
Cooper Bessemer Corp.
"Gray Iron From an Engineering Standpoint"

N. ILLINOIS-S. WISCONSIN
Hotel Faust, Rockford, Ill.
R. P. Schauss
Illinois Clay Products Co.
"Gating and Feeding of Castings"

● FEBRUARY 15
CENTRAL MICHIGAN
Kalamazoo
H. E. Elliott
Dow Chemical Co.
"Effect of Gating & Risering Design"

● FEBRUARY 17
TEXAS
Texas State Hotel, Houston
W. E. George
Booz, Allen & Hamilton
"Assured Profits for Your Business"

TRI-STATE
Tulsa, Okla.
J. A. Bowers
American Cast Iron Pipe Co.
"General Steel Foundry Practice"

● FEBRUARY 18
CHICAGO
Palmer House
Ladies Night

● FEBRUARY 20
QUAD CITY
Ft. Armstrong Hotel, Rock Island, Ill.
B. C. Yearly
National Malleable & Steel Castings Co.
"Malleable Gating and Feeding"

● FEBRUARY 24
ONTARIO
Royal York Hotel, Toronto
Group Meetings

● FEBRUARY 27
NORTHWESTERN PENNSYLVANIA
Moose Club, Erie
W. B. McFerrin
Electro Metallurgical Div., Union Carbide and Carbon Corp.
"Gray Iron Casting Defects"

Canton District

Alexander Prentice
Stark Foundry Co.
Chapter Reporter

December 1 meeting, held at Mergus Restaurant, Canton, featured a talk by F. H. Kayler, American Steel Foundries, Alliance, Ohio, on *"History and Engineering of Railroad Car Couplers."* Mr. Kayler was introduced by Chapter Program Director Thomas W. Harvey, Pitcairn Co., Barberton. Chapter Chairman George M. Biggert, United Engineering & Foundry Co., Canton, presided at the meeting.

Mr. Kayler opened his talk by saying, "The automatic railroad coupler is so strictly a casting job that no one has ever attempted to produce it as a fabrication—even early designs were made as malleable castings."

Mr. Kayler said that every railroad car in the United States and Canada must be capable of coupling with every other car on standard gage roads, involving some four million couplers.

The speaker went on to describe how standards for railroad equipment are set up, approved and voted on by letter ballot of members of the Association of American Railroads, with member roads having votes according to the number of their cars.

Movies were shown of actual tests conducted by American Steel Foundries to prove superiority of the company's patented railway car trucks over regular coiled-spring trucks.

A film, *"A Letter from America,"* loaned by the Goodyear Tire & Rubber Co., Akron, Ohio, and depicting the story of an immigrant's success in the United States, concluded the meeting.

Central Indiana

William K. Mitchell
L. W. and W. K. Mitchell Co.
Chapter Reporter

Approximately 120 foundrymen and guests attending the regular monthly meeting December 5 in the Athenaeum, Indianapolis, heard Eugene Comeaux, Illinois Cereal Mills, on *"Core and Molding Sand Practice."*

In his address, Mr. Comeaux suggested that all sand be prepared by mechanical mixer, and that all materials be added to sand on a basis of weight rather than by volume measurement. He pointed out that, in his opinion, expansion is the most important item to watch in coremaking, and warned foundrymen that one of the most important points, and one that is mostly frequently overlooked, is temperature control of sand.

Franz Schumacher, Cooper Alloy Foundry Co., Hillside, N. J., demonstrates "Modern Techniques in Plastic Patternmaking" at the November 15 meeting of the Eastern New York Chapter at Lathams, N.Y.

The speaker presented a series of slides demonstrating various bake-out times and their effects on castings, and another series illustrating defects caused by improperly baked cores.

Detroit

Vaughan C. Reid
City Pattern Foundry & Machine Co.
Chapter Reporter

Four hundred Detroit Chapter fathers and sons were guests of the Ford Motor Co. at a dinner and film showing at Ford's Rouge plant. The film was followed by a conducted tour of the Rouge plant's foundry division.

A highlight of "Father and Son Night" was the presentation of a gavel by Immediate Past Chairman A. W. Stolzenburg, Aluminum Co. of Amer-

ica, to Chapter Chairman R. J. Wilcox, Michigan Steel Casting Co. The gavel, unusual in design, is made of the following cast metals: stainless steel, malleable iron, aluminum, magnesium, gray iron and copper alloy, and was designed by L. H. Kinney of the Chrysler Corp. M. D. McQuary, also of Chrysler, procured the various cast metals, which were used by Vaughan Reid, City Pattern Foundry & Machine Co., an A.F.S. Past National Director and Past Chapter Chairman, in fabricating the gavel.

Tennessee

Carl A. Fischer, Jr.
Fischer Supply Co.
Chapter Reporter

Regular dinner meeting of the Tennessee Chapter was held November 18 at the Hotel Patten, Chattanooga. There were more than 50 guests and members present to hear A. Lesley Gardner, Pangborn Corp., Hagerstown, Md., speak on "*A Mechanized Cleaning Department Makes Money.*"

Mr. Gardner said one of the reasons America is so great is that it is progressive, always doing away with obsolete equipment and putting in modern and more efficient equipment, although the old equipment might have many years of life left.

The speaker stated that nature used sand and air to create the first blast cleaning machines, and that the principle of sandblasting originated when a man walking along a beach noticed how smoothly wind and sand had eroded objects. Finally, Mr. Gardner said, shot and grit replaced sand in cleaning of castings, and there have been improvements in blasting methods in modern times.

Mr. Gardner drew sketches of the stages of development of the sand blasting machine, and explained fully the principles of modern cleaning machines. He concluded by showing a sound film, featuring cleaning equipment used at the Ford Motor Co.

Having a pre-dinner discussion at the November meeting of the Northern-Illinois-Southern Wisconsin Chapter were, left to right: Raymond Stenstrom, Henry Swenson and Milton Stone, all of Greenlee Bros., Rockford.

Wearing festive headgear at the St. Louis District Chapter's Annual Christmas Party, held December 8 at the York Hotel, St. Louis, were, left to right: Chairman George N. Shepherd, Sterling Steel Casting Co.; Vice-Chairman John Williamson, M. A. Bell Co.; Secretary Paul Retzlaff, Busch-Sulzer Bros. Diesel Engine Co., and O. A. Berwin, Chapter guest.

Oregon

William Halverson
Electric Steel Foundry Co.
Chapter Reporter

Third dinner meeting of the season was held November 17 in the Georgian Room of the Heathman Hotel, Portland, and featured a talk by Ralph L. Lee, General Motors Corp., on "*Man to Man on the Job.*"

Mr. Lee's talk proved an inspiring and interesting one and many of his audience are writing for his book of the same name.

A.F.S. National Director Robert Gregg, Reliance Regulator Corp., Alhambra, Calif., was a visitor at the November meeting, as was John Russo, Russo Foundry & Equipment Co., Oakland, Calif., vice-chairman of the Southern California Chapter.

James Smith, instructor in industrial engineering and faculty advisor to the student chapter at Oregon State College, extended an invitation to Oregon Chapter members to attend a steak fry at the College's new core room, December 2.

Oregon State College

Scheduled speaker for the student chapter's November 9 meeting was Ben Kirby, Electric Steel Foundry, Portland, who was unable to attend. A film on the production of aluminum was shown and plans for the Annual Barbecue completed.

Quad City

R. E. Miller
John Deere Planter Works
Publicity Chairman

"Foundries are operating giveaway programs every day they run" was the theme of Walter F. Bohm, Buick Motor Div., General Motors Corp., Flint, Michigan, speaking on "*Cupola Operation*" at the November 21 meeting, held at the Fort Armstrong Hotel, Rock Island, Ill.

Mr. Bohm said that many foundries waste coke by operating with too large a coke split. An ideal ratio is 10 to 1, the speaker said.

To benefit in coke savings through a favorable coke ratio, Mr. Bohm finds it necessary to exercise stringent control of cupola practices. He recommends uniform coke, and finds it necessary to have good scrap specifications and proper charging. The charge should be leveled with sufficient coke

to cover it entirely, he said, and should be permeable for a soft blast.

According to Mr. Bohm the most important characteristic of coke is its structure, yet there is no means for testing it. If the structure is weak the loss in handling will be great and the usefulness in the cupola reduced, the speaker concluded.

Texas

E. P. Clarke
American Wheelabrator & Equipment Corp.
Publicity Chairman

November 18 banquet and technical meeting, held at the Dallas Athletic Club, was attended by 75 members.

Featured speaker of the evening was Clyde A. Sanders, American Colloid Co., Chicago, who with his "down to earth" approach to foundry sand problems proved an interesting and informative speaker. A lively discussion period followed Mr. Sanders' talk.

Chapter Chairman Charles McGrail, Texaloy Foundry Co., San Antonio, welcomed members and guests. The speaker was introduced by W. H. Lyne, Hughes Tool Co., Houston, chapter vice-chairman and program director.

Philadelphia

A. J. Saute
American Engineering Co.
Chapter Reporter

Annual Christmas Party was attended by approximately 600 members and guests December 6 at the Benjamin Franklin Hotel, Philadelphia.

The party committee was under the chairmanship of W. J. Gallana, Rodgers Brown Lavino Co., Philadelphia. Chapter Chairman William A. Morley, Link-Belt Co., Philadelphia, welcomed members and their guests and distributed prizes.

Ontario

C. H. Johnston
E. Long, Ltd.
Chapter Director

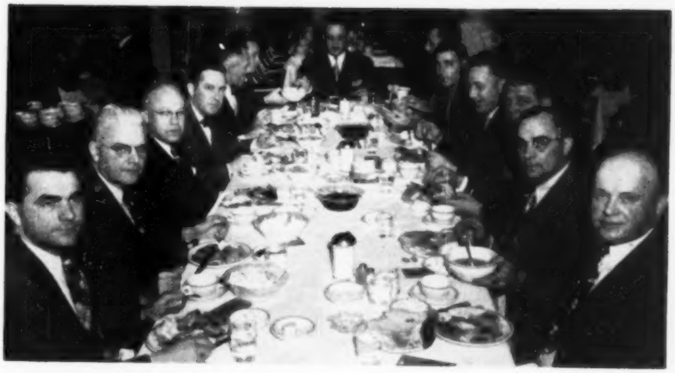
November meeting was held at the Royal Connaught Hotel, Hamilton, November 18. Chairman J. H. King, Werner G. Smith, Ltd., presided.

After dinner, the meeting was divided into non-ferrous and ferrous groups for technical sessions.

The non-ferrous group, with William Curry, Galt Castings Co., as chairman, held a general discussion and many practical points were covered.

Benton Dixon, Dominion Wheel & Foundries, Toronto, was chairman of the ferrous group. The discussion leaders were Burnie Morris, Gurney Foundry Co., Toronto, and Ernest Moss of the Hamilton Foundry Co., Hamilton.

The discussion was chiefly on chaplets and their stem sizes in relation to metal sections to insure fusion and to prevent leaking castings. Two sound films were shown on chaplets and chills and their applications. These films were shown courtesy of the Canadian Fanner Co., Hamilton.



Saginaw Valley Chapter members at the December 1 meeting, Frankenmuth.

Photographed at the Tennessee Chapter's November 18 meeting, held at the Hotel Patten, Chattanooga, were, left to right: standing E. C. Gilmour, Pangborn Corp.; Merritt Van Valkenburg, M. H. Rhodes, Inc.; and Fred H. McGee, Fred H. McGee Co. Seated, left to right: Porter Warner, Jr., Porter Warner Industries; and A. Lesley Gardner of Pangborn Corp.

Rochester

Donald E. Webster
American Laundry Machine Co.
Chapter Reporter

December 13 meeting of the chapter was planned to appeal particularly to patternmakers but was of interest to all foundrymen attending.

Speaker of the evening L. Beinke, Plaster Process Castings Co., Cleveland, in speaking on "*Aluminum and Plaster Pressure Plates*" stated that these plates are being used more and more because foundrymen are pleased with their accuracy and the minimum of time and effort required to prepare them for production. Probably the most common application of these plates is in squeezer molding, Mr. Beinke said, but some large single patterns have been produced for use on other molding machines.

Mr. Beinke's talk, illustrated with slides, followed through checking of the master pattern, locating the parting line, arrangement of patterns on plates for economical production, to details in handling of plaster and clay. It has been found desirable to prepare these plates without fixed gates, so that any desired changes in gating may be more readily made later on by the foundry, he said.

Thickness of the aluminum pattern sections are kept as uniform as possible, Mr. Beinke said, by recessing from the back and using reinforcing bars where needed, but shrinkage must be carefully controlled by the use of proper

(Continued on Page 87)

NEW . . . Foundry . Products

Readers interested in obtaining additional information on items described in New Foundry Products should send requests to Reader Service, American Foundryman, 222 W. Adams St., Chicago 6, Ill. Refer to the item by means of the convenient code numbers.

Pneumatic Vibrator

JA1—Cleveland Vibrator Co.'s newly developed vibrator features a vise-like head, which facilitates easy attachment to any 2 x 4, 2 x 6 or 2 x 8 in. wooden stud or to metal structural members of comparable sizes. Unit is adaptable for diversified applications in which a high

degree of portability is necessary in addition to high frequency vibration. Vibrator has operating speeds ranging from 3600 blows per min at 100 psi line pressure to 1000 blows at 50 psi line pressure. Air consumption varies from 5 to 10 cfm, depending on operating speed and line pressure. Weighing approximately 11 lb the unit is 8½ in. long, 5⅛ in. wide, and 3 in. high. All vibrators are equipped with 360° swivel connector.

Portable Dust Collector

JA2—Kirk & Blum Mfg Co.'s Type M heavy duty portable unit dust collectors can be set up anywhere to serve one or several machines for any period of time, or can be readily moved to meet changing needs. They eliminate the need for long, costly pipe runs to remote areas of a plant where only a few machines are located. Compact, self contained and ready to operate. Type M units consist of a motor, exhauster, centrifugal pre cleaner and steel wool filter after cleaner. Unit may also be equipped with exhaust stack and filters for returning clean air to building during winter months and for venting air outside during summer months.

Core Baking Tunnel

JA3—Induction Heating Corp. announces the addition of Model M-285AD core baking tunnel to its line of electronic core baking units. Model M-285AD is a low-cost unit with a capacity of 375 lb of cores per hour and capable of handling cores up to 16 in. wide by 7 in. high. The unit has a variable speed dial feed, adjustable electrodes and a complete blower exhaust system. Designed for the small foundry, Model M-285AD is so arranged that both loading and unloading may be readily handled by the same coremaker.

Industrial Crane

JA4—Model 66, a new crawler-mounted industrial crane announced by the Wayne Crane Div., American Steel Dredge Co., has a capacity of 7.5 tons, weighs approximately 25,000 lb and is easily convertible to a magnet, ½ yard dragline, clamshell, shovel or trench hoe. Bearing length of crawler is 8 ft 5 in. with a width of 8 ft, making for stable 360° operation. Self-

cleaning non-clogging treads can be used with grousers. Features include worm driven or live boom hoist, unit replacement of all sub-assemblies, built-in counterweight to reduce rear end clearance of cab, 15 in. diameter drums for increased life of wire rope, anti-friction bearings and all welded chassis. Crane swings at 6.2 rpm and travels, lifts, booms and swings simultaneously. Standard power unit is six cylinder, 62 hp at 1800 rpm gasoline engine. Other engines optional.

Temperature Control Unit

JA5—Xactline, a straight line temperature control unit offered by the Claud S. Gordon Co., is used with any standard pyrometer controller for unusually close temperature variation control in molding, tempering, aluminum heat treating and other precision heat processing fields. Extreme sensitivity of this unit has kept temperature variations as low as 1/5 degree F plus or minus and power on-off cycles as short as three seconds, manufacturer claims. Xactline is fully automatic and is not dependent upon mechanical coordination with other equipment. It is readily applicable to all types of electric furnaces, ovens, injection molding machines, etc., employing conventional millivoltmeter and potentiometer controlling pyrometers or gas-fired equipment employing solenoid-controlled or motor-operated valves. Unit is furnished ready to connect and can be wall or flush mounted.

Safety Goggle

JA6—Chicago Eye Shield Co.'s Coverlite safety goggle is extremely light in weight but exceptionally sturdy. Injection molded, non-flammable plastic frame gives full protection from impact, dust, flying sparks and chips. Ample air space and ventilation prevent fogging, while large frontal area provides wide range of vision in all directions. Head band is easily adjustable. Coverlite is available in light green or dark transparent frames and can be worn over spectacles.

Tier Truck

JA7—Designed to speed up handling of parts and materials, Donaldson Co., Inc.'s flexible tier truck rolls easily on casters, stacks to any practical height and permits

complete visibility of truck contents. The basket-type truck is equipped with two wheels and one full-swiveling caster for rolling truck directly to production line. One operator can move it about easily. Standard lift-truck forks can handle tier trucks whether on floor or stacked and

self-aligning feature centers one basket on another. Tier truck measures 48 in. long, 30 in. wide, and 32½ in. high, with weight capacity of 1000 lb and volume capacity of 25 cu ft.

Conveyor Belt

JA8—Lee Rubber & Tire Corp. announces a belt for conveying hot materials, which features a carcass constructed of multiple plies of glass fabric, plus a heat-resistant cover. Manufacturer claims that this belt has given over 11 month's service in a large foundry where hot shake-out sand is carried at temperatures up to 400 F. Previously, manufacturer says, 10 weeks' service was considered good for regular hot material belts.

Hardfacing Rod

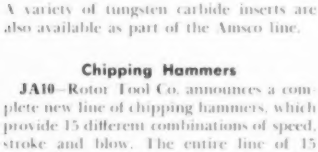
JA9—Amsco Tube Tungsite, a tungsten carbide hardfacing rod developed by the American Brake Shoe Co., consists of finely granulated particles encased in a tube of mild steel. In welding, the tube melts to form a matrix for the hard carbide particles, thus creating a wear-resistant surface. Tube Tungsite and Tungrod are supplied in a wide range of granulations, from 5-8 to 40-125 screen mesh. A variety of tungsten carbide inserts are also available as part of the Amsco line.

Chipping Hammers

JA10—Rotor Tool Co. announces a complete new line of chipping hammers, which provide 15 different combinations of speed, stroke and blow. The entire line of 15 Multi-Power Chippers is based on five basic models, C-10, C-15, C-20, C-25 and C-30, ranging from 1 in. to 3 in. piston stroke. Each of the five basic sizes is adjustable to three combinations of speed and blow and all 15 sizes are equally productive through the entire range of speeds, blows and strokes. Component parts are interchangeable and barrel breakage has been eliminated by advanced methods of honing and heat treatment. Entire line is claimed by manufacturer to be the lightest and shortest on the market today.

Cut Wire Abrasive

JA11—Cut drawn steel wire shot is claimed by its manufacturer, Cleveland Metal Abrasive Co., to be decidedly superior to other blast cleaning and peening



abrasives in uniformity of physical properties and maintenance of size. 20th Century Cut Drawn Steel Wire Shot is extremely tough and durable and is claimed to outlast hard iron shot 8 to 1 and cast steel shot at least 2 to 1.

Electrolytic Polisher

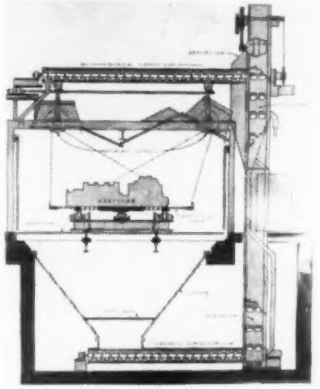
JA12—Precision Scientific Co. announces a rapid, convenient laboratory apparatus for the polishing of metals for microscopic examination. The apparatus provides a means for microscopic examination of the structure and grain size of metals to appraise such working properties as machinability and ductility. Polisher is made up of two units, an electrolyte bath and a rectifier assembly, which is equipped to convert a-c current to d-c. All necessary controls are supplied. Unit will polish carbon and alloy steels, aluminum alloys, nickel alloys, copper, brass, etc.

Portable Electric Saws

JA13—Independent Pneumatic Tool Co.'s new line of portable electric saws features long-shaft transverse motor mountings for extra power and longer tool life. Models are available in 6, 7, 8, 9, 10 and 12 in. sizes. Features include die cast aluminum housings, steel inserts for permanent alignment, built-in saw blower; adjustable steel rip-guides; ball bearing blade guard with rubber snubber; finger-tip control for depth and bevel cuts.

Airless Blast Room

JA14—Pangborn Corp. announces the Roto-Blast Room, which provides airless, centrifugal blast cleaning for large castings where size requires cleaning in room-type structures. Rubber-lined steel blast



rooms, available in varying sizes, are served by two standard Roto-Blast units and an abrasive separator, which cleans the metal abrasive and returns it to the unit for re-use. Power-driven blast room car is provided to facilitate loading and unloading of large castings; it enters the blast room on its own track and is equipped with a 10 ft diameter work table, which is turned by contact with friction wheel and revolves at speeds from 4.3 to 13 rpm to expose all sides of the casting to blast stream. Cleaning room workers remain outside blast station and do not require protective clothing and helmets. A single worker can run the entire Roto-Blast cleaning room.

Atmosphere Analyzer

JA15—Lira, Mine Safety Appliances Co.'s new infra-red analyzer for measuring atmospheric contamination operates on the principle that most gases, vapors and liquids absorb infra-red light in a portion of the spectrum which is specific for each product. The mixture to be analyzed is introduced into a sample tube and its infra-red absorption compared with that of a standard filter tube. Thus it is possible to detect low gas concentrations—analysis can be made in the range 100 to 1 parts per million and in some instances concentrations are detectable to less than 1 part per million. Each instrument is custom built for specific services.

Thermal Expansion Meter

JA16—The measurement of thermal expansion in sands, ceramics and metals can be made with ease and accuracy with the Expansiometer, according to the manufacturer, the Harry W. Dietert Co. The Expansionmeter is constructed of fused quartz

and has a sensitive dial indicator attached. Samples may be as large as 1⅛ in. diameter and 3 in. long. Measurements at temperatures up to 2500 F are obtained by inserting the Expansiometer horizontally into any suitable furnace.

Gas Welding Supplies

JA17—Describing 19 different gas welding rods, 8 fluxes, silver brazing alloys and carbon rods and plates, Air Reduction Co.'s new catalog on gas welding supplies is indexed for ready reference and can be inserted in a loose-leaf binder. The text material offers descriptions of the mechanical properties of the various products and recommendations regarding their application. Data on lengths, packaging and available diameters for each welding rod are listed in the catalog.

Bridge and Amplifier

JA18—Ellis Associates' BA-1 Bridge and Amplifier provides the missing link between SR-4 gages and similarly actuated pickups and any cathode ray oscilloscope. The combination makes a versatile mechanical measuring device which gives an insight into all types of mechanical problems of function as well as of strength. Vibration, damping, displacement, acceleration, pressure weights, loads and stresses can be seen during actual operation. Consisting of a complete package of bridge elements, signal chopper, calibration system, amplifier and power supply, the BA-1 Bridge and Amplifier will measure practically any mechanical reaction, drives any standard cathode ray oscilloscope, covers a wide frequency range from static to high frequency, calibrates at any time during test and is simple to set up and operate.

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American Foundryman

Compounded to Stand the Test

. . . a fact indicated by unsolicited testimonials from firms using this monthly magazine to reach the "*buying influences*" of the metal castings field.

HOLD THAT SAND!...
WITH AMAZING NEW
SAND ARRESTER TUBE!
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POSITIVELY ELIMINATES SAND STEMS ON BLOWN CORES!

- GUARANTEED FOR MORE THAN 100,000 BLOWS
- AUTOMATICALLY DELIVERS PERFECT CORES
- APPROVED BY THE MOST EXPERIENCED FOUNDRYMEN
- INSTALL WITHOUT SPECIAL TOOLS
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- TOUGH ELASTIC RUBBER FUSED TO SEAMLESS STEEL TUBES BY OUR OWN SPECIAL PROCESS
- STEEL TUBE HEAVILY PLATED AND RUST PROOF
- SAND FLOWS FREELY INTO CORE BOX
- ...ES CORES, TIME and MONEY

MARTIN
ENGINEERING COMPANY
KEWANEE ILLINOIS

Mr. John D. Murray, Adv. Mgr.
American Foundryman
222 W. Adams St.
Chicago 6, Ill.

Dear Mr. Murray:

Enclosed is a schedule of advertisements that our company has decided upon for American Foundryman. Frankly, we are very pleased with results to date. Coupons have been coming in consistently, and we are checking these carefully to gauge the market.

Of those received so far, American Foundryman has a distinct edge in the number of inquiries, with the advantage of an average ratio of 2 to 1 in sales over other publications.

It is on this record that we have decided to expand the schedule, per the enclosed.

Very truly yours,

MARTIN ENGINEERING COMPANY

E. F. Peterson

E. F. Peterson, Pres.

EFP/

There is no mistaking results and, from the tone of the letter reproduced here, there is no mistaking the fact that AMERICAN FOUNDRYMAN, judged in terms of results, is the leading sales producer for the marketing of foundry equipment and supplies.

Yes, you've seen this advertisement reproduced in the pages of media reaching the foundry field, and you will be interested to know that the advertiser has kept a close tally on returns. The outcome was conclusive . . . AMERICAN FOUNDRYMAN **outpulled other magazines 2 to 1** in completed sales! This can mean only one thing—AMERICAN FOUNDRYMAN is the magazine that manufacturers can depend upon for results . . . **the kind of results that mean profitable advertising.**

AMERICAN FOUNDRYMAN can "pull" equally as many returns for those firms whose products are suited for use by the thousands of subscriber-members who regularly look to **"The Foundrymen's Own Magazine"** as a reliable source of information on the development and production of cast metals.

If AMERICAN FOUNDRYMAN isn't already scheduled for your 1949-50 sales program, it is only **good business** to do so immediately—it costs less than 2c per prospect to reach the readers of AMERICAN FOUNDRYMAN each month with an ad similar to the one reproduced above. Send for full details today!

American Foundryman

222 W. Adams St.,
Chicago 6, Ill.

FOUNDRY *Literature*

Readers interested in obtaining additional information on items described in Foundry Literature should send requests to Reader Service, American Foundryman, 222 W. Adams St., Chicago 6, Ill. Refer to the items by means of the convenient code numbers.

Non-Ferrous Casting

JA101—A 16-page illustrated catalog describes non-ferrous casting and wood and metal pattern operations at the Wellman Bronze & Aluminum Co. Subjects covered include magnesium and aluminum alloys, polishing aluminum, copper-base alloys and pattern shrinkages. Tables are given showing chemical, mechanical and physical properties of Wellman castings.

Safety Equipment

JA102—Willson Products, Inc.'s 64-page catalog of eye respiratory equipment contains a fund of technical and reference material for use in selecting proper types of equipment for specific occupational hazards. Among subjects discussed are: a digest of U. S. specifications for heat-treated glass, plastics applied to the safety field, filter glass, respiratory hazards and types of respirators, and gas mask selector tables. Profusely illustrated, the catalog contains several charts showing the comparative features of various styles of safety equipment.

Gas Cutting Slide Chart

JA103—Newly reprinted and available on request is Air Reduction Co.'s oxyacetylene machine gas cutting slide chart. The chart covers Airco Style 124 and high-speed Airco 45 cutting tips, available in 18 sizes and all covered in the chart. By sliding the chart to the indicated tip number, oxygen and acetylene pressures, speed in inches per minute, gas consumption and approximate width of kerf are easily read down one column. Cleaning drill sizes are also indicated. The chart is pocket sized, 2¾ x 7 in., and is coated with a long wearing varnish.

Optical Pyrometer

JA104—Pyrometer Instrument Co.'s Catalog No. 90 describes the Bi-Optical Pyrometer. This instrument has two direct-reading scales which are manipulated individually until a perfect blending of a known brightness is made with the object under measurement. Direct readings of black body and color temperatures can then be made. Also described in the catalog is the Pyro Micro-Optical Pyrometer for measuring temperatures of small objects in the laboratory.

Fork Truck Operation

JA105—Yale & Towne Mfg. Co. offers to materials handling engineers, industrial truck maintenance men and truck operators a four-page folder giving instructions on safe and economical operation of gasoline fork trucks. A total of 25 suggestions on engine starting, engine running and safe operation are given. Major points highlighting essentials of fork truck operations are summarized in such a manner as to make the folder useful in training.

Made-To-Order Jobbing

JA106—Bulletin AS-400 describes the facilities and products of the Hardinge Mfg. Co., formerly Steacy-Schmidt Mfg. Co. The 12-page illustrated bulletin includes information on patterns, castings, machine work, plate steel work, and custom-built machinery made in the Hardinge plant.

Fuel Oil Solvent

JA107—A revised and enlarged six-page folder published by the E. F. Houghton Co. describes the physical composition, functions and results obtained with Houghto-Solv, a fuel oil additive, designed to dissolve sludge in storage tanks and throughout fuel systems. Included among the folder's many photographs are microphotos showing Houghto-Solv dispersing sludge deposits. Houghto-Solv "W", an additive for emulsifying free water in the fuel system, is also described in the folder.

Welding Rod Chart

JA108—A selector and comparison chart of hardfacing rods and electrodes, Bulletin CC-3, is available from the American Manganese Steel Div., American Brake Shoe Co. The chart lists each of Amsco's welding rods and electrodes and indicates type of service for which each is designed. Metallurgical and physical descriptions of each rod are arranged to simplify selection. For comparison, competitive rods of like properties are listed.

Magnetic Separators

JA109—An eight-page catalog, released by the Dings Magnetic Separator Co., describes electric and non-electric magnetic pulleys, non-electric magnetic drums, triple-pole rectangular magnets, lifting magnets, non-electric plate magnets and high intensity induced roll and cross magnetic separators.

Non-Destructive Tester

JA110—Sperry Products, Inc., announces Bulletin 50-105, describing the Type UR Reflectoscope, an ultrasonic, non-destructive testing instrument for instantly locating defects in metals and other materials by application of a single searching unit. Reflectoscope penetrates up to 30 ft of material, is portable and finds minute defects in raw stock, semi-finished or finished pieces.

Ladles

JA111—Whiting Corp.'s Bulletin FY-163 describes and illustrates the full line of Whiting ladle equipment. The catalog contains 53 photographs, 25 drawings and 25 specification tables giving dimensional data and capacities of all Whiting ladles.

Sand Control Equipment

JA112—A 12-page folder released by the Harry W. Dietert Co. deals with two complete high temperature testing laboratories for determining the physical properties of molding materials and ceramics at elevated temperatures. The front portion of the folder is a technical data section dealing with casting defects and how they can be reduced or eliminated by watching high temperature properties of various molding materials.

Blast Cleaning Machine

JA113—The redesigned 48 x 72 in. Wheelabrator Tumblast—an airless abrasive blast cleaning machine—is described in American Wheelabrator & Equipment Corp.'s Bulletin 111-A. Photographs and diagrams illustrate the construction, specifications and applications of the redesigned Tumblast, which handles heavy blast cleaning of gray iron, steel and malleable iron castings.

Graphitized Pig Iron

JA114—Tonawanda Iron Div., American Radiator Co., has recently released a 12-page plastic-bound brochure describing the chemical and physical properties and applications of the company's G-Iron, a graphitized pig iron, developed to eliminate effects of chemical impurities in castings. Several photomicrographs are used to compare grain refinement of G-Iron with regular pig. Also illustrated are comparative grain structures of G-Iron and regular pig, and structures of varying silicon content G-Irons. Concluding the brochure are data on shrinkage, machinability, physical properties and a silicon-carbon chart.

CHAPTER ACTIVITIES

(Continued from Page 81)

chills and by introducing the metal into the molds under pressure.

The fact that only one master pattern is needed helps the foundry to reduce pattern cost. The supplier then prepares the necessary number of duplicates, mounted as agreed on the proper size plate, he added.

The speaker also touched on recent work done with plastics as pattern and core box material. Although high in cost at the moment the future of these products shows promise, he concluded.

Twin City

O. J. Myers
Werner G. Smith Co.
Chapter Reporter

ANNUAL JOINT MEETING of the Chapter and the North West Chapter of the American Society for Metals was held at the Covered Wagon, Minneapolis, on November 17, when nearly 200 members and guests heard J. C. Neemes, Jr., International Nickel Co., speak on *"Ductile Cast Iron."* ASM Chapter Chairman A. T. Ridinger presided over the meeting.

The speaker defined ductile iron and told of the background of its discovery. He clarified the terminology in use today and then went on to explain how spheroidal cast iron could be distinguished from flake iron.

Mr. Neemes described the foundry characteristics of ductile iron, with special emphasis on the castability, good fluidity, homogenous structure (throughout various thicknesses of casting sections), and slightly greater chilling tendencies.

Specific analyses and physical properties of various types of ductile iron were next discussed and actual examples of useful castings being made today were appraised.

Saginaw Valley

Kenneth H. Priestley
Vassar Electroloy Products, Inc.
Chapter Reporter

PANEL DISCUSSION on *"Metal Control"* was the main feature of the December 1 meeting, held at the Fischer Hotel, Frankenmuth, Mich. Technical chairman was Walter F. Bohm, Buick Motor Div., GMC, Flint.

The panel discussion was divided into three sections, covering gray iron, malleable iron and light metals. Gray iron metal control was discussed by Roy Foster, Bay City Foundry Co., Bay City; malleable control by Arthur Karpicke, Central Foundry Div., GMC, Saginaw; and light metals control by Manley E. Brooks, Dow Chemical Co., Bay City. Each of the speakers stressed the importance of the melting unit and

melting practice on metal control. The speakers stated that there are many simple tests which can be set up to control the quality of molten metal. Discussion from the floor followed the talks.

Michiana

J. P. Jordan
Dodge Mfg. Corp.
Chapter Secretary-Treasurer

SPEAKER at the December 5 meeting, held in the Bronzewood Room of the Hotel LaSalle, South Bend, was Ralph L. Lee, General Motors Corp., who addressed the group on *"Foundry Problems in General."* Mr. Lee combined both sincerity and humor in his talk.

Philadelphia

A. J. Saute
American Engineering Co.
Publicity Chairman

NOVEMBER 11 MEETING, held at the Engineers' Club, Philadelphia, and attended by 150 members and guests, featured an address by Zigmund Madacey, Caterpillar Tractor Co., Peoria, Ill., on *"Does Core Blowing Belong in Your Shop?"* Mr. Madacey was introduced by Technical Chairman Hans Jacob, Lehigh Foundries, Easton, Pa.

Mr. Madacey stated that necessary factors in successful core blowing are sand control, know-how, and cooperation between various departments involved in the process. Mr. Madacey added that almost any foundry will achieve speed in production and effect substantial savings by using modern core blowing machines.

Northwestern Pennsylvania

Earl M. Strick
Erie Malleable Iron Co.
Chapter Reporter

SPEAKER at the November 28 meeting, held at the Moose Club, Erie, was Thomas E. Barlow, Eastern Clay Products, Inc., Jackson, Ohio. Choosing as his subject *"Let's Kick It Around,"* Mr. Barlow discussed flowability of core sands, core infiltration, troublesome molding sands, and the patching of cupolas.

Speaking on flowability of core sands, Mr. Barlow said that this phase of foundry operations is becoming increasingly prominent and that with extensive use of core machines today, correct sand mixtures are needed to assure sound castings.

Improper sand mixes are the chief causes of core sand infiltration troubles, the speaker said, adding that molding sand problems start in the core room and troublesome sands cannot be cured by all the sand testing equipment in existence if the results are filed away and not used.

Mr. Barlow concluded by citing the importance of correct cupola patching to prevent iron flowing into the wall, causing bridging, cold iron and changes in metal analysis.

Northern California

Milton Oakes
American Manganese Steel Div.
Publicity Chairman

DECEMBER MEETING of the chapter, held at Pland's Broadway, Oakland, December 9, featured a talk by D. C. Caudron, Pacific Brass Foundry, San Francisco, a chapter member.

Mr. Caudron spoke on *"Gas Fired Melting of Copper Base Alloys Under Reducing Atmosphere,"* a paper he presented at the 1949 A.F.S. Convention in St. Louis last May. A group discussion followed the talk.

Mo-Kan

Thomas F. Shadwick
Witte Engine Works
Chapter Reporter

HOLIDAY DINNER DANCE party of the Mo-Kan Chapter was held December 7 in the Ballroom of the Hotel President, Kansas City, Mo., and attended by some 200 foundrymen, their wives and guests.

Beginning with a social hour, the evening featured a dance and dinner party. Highlights of the party were community singing, led by Treasurer Herman Schwickrath, Pryor Brass Mfg. Co.; introduction of chapter officers and directors; drawings for 20 beautiful prizes contributed by foundries and

foundry equipment firms; songs by a male quartet; and dancing. Compacts were presented to all lady guests as party favors. Concluding the dinner, Donald Morton, Morton-Myers Co., complimented the Chapter on a successful first year and expressed the hope that the young chapter would have a bright future.

Chapter Chairman J. T. Westwood, Blue Valley Foundry Co., presided over the festivities. The evening was an exceptionally enjoyable one.

Washington

Harold R. Wolfer
Puget Sound Naval Shipyard
Chapter Reporter

November 18 meeting, held at the Gowman Hotel, Seattle, opened with a coffee talk by A.F.S. National Director Robert Gregg, Reliance Regulator Corp., Alhambra, Calif., on aims and policies of the Society.

Featured speaker of the evening was Ralph L. Lee, General Motors Corp., who spoke to the group on *"Man to Man on the Job."*

In this age of production, the speaker said, success depends on working with others. Standardization and precise measurements, Mr. Lee said, have made modern technology possible, but we need facts about people—a "humanometer" to gage the human element in industry.

Mr. Lee added that the man who successfully directs human efforts in production must have the qualities of a human catalyst. He must use people as they are, in all their divergent characters, must understand them as they are and change them both for their own good and that of their employer.

Just as metals can be made useful by alloying, so can "alloying" treatment be applied to people to bring out their best qualities, Mr. Lee concluded.

N. Illinois - S. Wisconsin

Jerry M. Zilka
Gunite Foundries Corp.
Technical Secretary

Over 100 members and guests attended the dinner meeting October 8 at the Beloit Country Club, Beloit, Wis. William Ball Jr., R. Lavin and Sons, Inc., Chicago, spoke on *"The Effective Essentials Required in Making a Casting."*

In his introductory remarks Mr. Ball said that the foundry has played an important role in making the world what it is today.

In Mr. Ball's estimation the foundryman's life is a balance of the "Three M's"—Material, Machines and Men. Many foundrymen have kept abreast of the changing world as far as the first 2 "M's" go, he said, but it is now necessary that the foundryman recognize the importance of the last of the three "M's"—Man.

Eastern Canada
A. J. Moore
Montreal Bronze, Ltd.
Publicity Chairman

A.F.S. FILM, *"Fluid Flow in Transparent Molds,"* was shown at the November meeting. A.F.S. Technical Director S. C. Massari provided a running commentary on the film, which is a report on one of the A.F.S. research projects under way at Battelle Memorial Institute, Columbus, Ohio.

Mr. Massari's talk revealed a thorough knowledge of the project and impressed the audience with the research work being carried out by A.F.S. to benefit the foundry industry.

Lucky winner of a television set at Mo-Kan Chapter's Christmas Dinner Dance, December 7, was Mrs. L. E. Flanders of Independence, Mo., shown with Mo-Kan Chapter Chairman J. T. Westwood, Blue Valley Foundry Co., Kansas City, Mo.

Quad City
R. E. Miller
John Deere Planter Works
Publicity Chairman

CHRISTMAS PARTY of the Chapter was a big success. The party was held in the Blackhawk Hotel on the Iowa side of the Quad Cities. There was no formal session and nothing technical was discussed. Refreshments were served, followed by a large meal and a big helping of entertainment.

A. H. Putnam, A. H. Putnam Co., Rock Island, Ill., provided the entertainment, while A. D. Matheson, French & Hecht Div., Kelsey-Hayes Wheel Co., Davenport, Iowa; William O. McFatridge, International Harvester Co., Rock Island; and J. H. Nelson carried detail work for the party through with precision.

(Continued on Page 92)

FOUNDRY FIRM FACTS

Hydro-Line Mfg. Co., Rockford, Ill., announces the appointment of the **Austin-Hastings Co., Inc.**, 226 Binney St., Cambridge, Mass., as its representative in the New England states, excluding Connecticut; and **Hydro Pneumatics, Inc.**, 95 Liberty St., New York, as metropolitan New York and Northern New Jersey representative for its line of air and hydraulic cylinders and special machinery.

Howard Foundry Co., Chicago, has purchased an industrial plant at Bloomingdale and Lamon Aves., Chicago, from the Reconstruction Finance Corp.

Doehler-Jarvis Corp., aluminum and zinc alloy foundry, is building an addition to its plant at 2259 W. 43rd St., Chicago.

Whiting Corp., Harvey, Ill., and Los Angeles, has appointed **Carl F. Miller & Co., Inc.**, with offices at 1217 Sixth Ave., South, Seattle, and South 121 Madison St., Spokane, Wash., as agents for the Whiting line of foundry equipment.

High Frequency Foundry Sales Corp., New York, representative for Thermex Electronic core baking equipment, has been appointed foundry representative in New York, New Jersey, New England and Eastern Pennsylvania for the **Service Conveyor Co.**, Detroit, designers and fabricators of materials handling systems. The organization will handle sales of conveyors, cranes, storage bins, hoppers, batch measuring equipment and molding machine turn tables.

Newman Foundry Co., Kendallville, Ind., recently completed construction of a new cleaning and shipping room, built as an addition to Newman Foundry Co.'s original foundry building.

Niagara Blower Co., New York, has been awarded a license to manufacture dehumidifying and air conditioning equipment under a patent method developed by the Research Corp., New York. The process dehumidifies air by contact with a liquid spray, which is then reconcentrated, discharging the moisture outdoors.

Combustion Engineering-Superheater, Inc., New York, recently introduced "Superspun," a cast iron pipe precision-controlled by use of sand-lined molds and concentric methods of forming the pipe. Centrifugally-cast in spinning sand molds, "Superspun" is claimed to be of uniform diameter and thickness throughout, seamless, of uniform grain structure, and can be cut with a pipe cutter in the manner of steel pipe. Combustion Engineering's "Superspun" pipe is produced by an almost completely automatic process involving 42 operations in 25 timed sequences.

Lester, Hankins and Silver, a new management engineering firm, has been established with offices at 140 Cedar St., New York, and 1605 Race St., Philadelphia. The organization will act as consultants on management, distribution and sales problems for manufacturers of machinery and other technical products.

Gerlinger Equipment, Inc., Milwaukee announces the opening of a new branch office at 38 South Dearborn St., Chicago. The office will handle sales and service of molding machines, core blowers, sand mixers, sand-slingers, core ovens and miscellaneous foundry equipment and will be in charge of Don Gerlinger, company vice-president.

Ironton Fire Brick Co., Ironton, Ohio, announces that it has now put into operation its new specialty unit for the manufacture of increased quantities of Ironton Berlite and Ironton Caro-Line, and is planning construction of a new unit for production of Ironton Nojoint, for desulphurizing ladles.

Some of the foundrymen attending the October 10 meeting of the Central Ohio Chapter. (Photo courtesy W. H. White, Jackson Iron & Steel Co.)

Ira Chandler, John Deere Planter Works, Moline, reported such an overflow crowd at the dining room door that many foundrymen were forced to eat at the local restaurant. In all, 307 members and their guests started off a successful holiday season.

Eastern Canada

A. J. Moore
Montreal Bronze, Ltd.
Publicity Chairman

REGULAR monthly meeting of the Chapter was held December 9 at the Mount Royal Hotel, with Alexander Pirrie, Gurney Foundry Co., Ltd., Toronto, speaking on *"Pattern Engineering and Foundry Practice."* In his talk, Mr. Pirrie pointed out the advantages of a thorough understanding between patternmaker, design engineer and foundry superintendent in making up patterns, drawings and devising production methods.

Throughout the talk and discussion period following it, Mr. Pirrie demonstrated a thorough knowledge of patternmaking and foundry processes. A. J. Moore, Montreal Bronze, Ltd., was technical chairman of the meeting.

Chesapeake

Jack H. Schaum and George L. Webster
National Bureau of Standards
Chapter Reporters

NOVEMBER meeting started with an afternoon tour of the Baltimore plant of the American Radiator & Standard Sanitary Corp. About 30 members saw the fast moving molding, pouring and shakeout line, followed by an interesting process in which the sanitary ware received an enamel finish.

After dinner at the Engineers' Club, over 60 foundrymen saw the A.F.S. sponsored research film, *"Fluid Flow in Transparent Molds."* The project was conducted at Battelle Memorial Institute and the film was introduced and narrated by Dr. R. F. Thompson of the International Nickel Co. The fluid flow principles demonstrated by high speed photography gave attending foundrymen a good insight into the solution of many gating problems.

Harry E. Ladwig (left) and Chapter Treasurer Leon Decker, both of Allis-Chalmers Mfg. Co., Milwaukee, at the Wisconsin Chapter's October meeting.

LETTERS TO THE EDITOR

(Continued from Page 74)

cast irons and those of malleable cast irons, there would be little cause for the present agitation (*"What's in a Name?"* AMERICAN FOUNDRYMAN, October and November, 1949). It has been rather conclusively established that certain differences in physical properties do exist for the two types of cast irons under consideration, and it has also been just as conclusively established that the graphite of either type does not possess a physical appearance, or properties, all of which are common to the other.

The heat-treated white cast irons have long been referred to as "malleable irons," and it is believed that not only has this been justified, but that, for the sake of precedent, this custom should be continued. Since some of the new types of cast irons may also be just as rightly termed malleable, it would be necessary to qualify the term to apply to both types.

One of the arguments presented in the October, 1949, issue of AMERICAN FOUNDRYMAN states that customarily employed terms such as "nodular," "spheroidal" "spherical," or "spherultic" should be suitable for the new type cast irons, and that "nodular and nodule already are the subconscious choice of most workers in the field." It is the opinion of the writer that none of these terms should be employed in describing the new cast irons unless they are qualified. Otherwise, the "diehards" or "hangers-on" might be reluctant to adopt a new use for an old term, as in the case of "nodular." In addition, there would be the inertia of traditional usage which would tend to cause the term to be used as it has in the past, that is, to describe the graphite of heat-treated white cast irons, even in the absence of deliberate intent to do so.

Why not call the new cast iron "as-cast malleable"? The old type could still be referred to as simply "malleable," or if desired, "heat treated malleable," or "heat treated white cast iron."

As an alternative, the new type might be called "ductile cast iron" to differentiate it from malleable cast iron. The use of a relatively simple term such as "ductile" would be justifiable even if it could be undeniably proved that its intrinsic meaning barred its use otherwise. For those requiring satisfaction as to the validity of differentiating between these cast irons in this manner, it would probably be less difficult to substantiate the qualified use of the term "malleable."

In conclusion it would seem feasible to avoid using any of the several terms available for describing the graphite of the new cast iron. They are either too cumbersome, or academic sounding. Also, the term "nodular" is not recommended because of its previous association with the graphite of heat-treated white cast irons. The term "ductile" is not recommended because of its close relationship with the term "malleable." It is suggested that the new irons be called "as-cast malleable," or "malleable as-cast."

PROF. HAL W. MAYNOR, JR.
Iowa State College

The term "nodular iron" correctly designates those irons that have a rounded graphite form which results from treating the irons with sufficient cerium, magnesium, or other nodularizing agents.

Nodular indicates a general graphite form which assumes the shape of a lump, an aggregate, or a round particle built around a central nucleus. Other terms such as spheroidal, spherulitic, quasi flake, flake-aggregate, and others are useful in more exactly describing the specific type of nodular graphite that is present in the structure.

As in certain malleable irons, spherulitic or spheroidal nodules are found in nodular irons. Such nodules of graphite are similar to nodules known in geology and consist of layers of material that radiate from a common center. These spheroidal nodules of graphite are a specific type that approach a sphere in shape.

As suggested by Morrogh, the term quasi-flake is descriptive of that type of nodular graphite that has the appearance of flake graphite but is of a form different from that of normal flake graphite.

From observation of various nodular iron structures, it has been found that the graphite in such irons may have a number of forms, all of which should be classified as nodular. Other terms are useful only in describing the particular type of nodular graphite present in the structure of such irons.

W. C. JEFFERY, *Met.*
Production Foundries Div.
Jackson Industries, Inc.
Birmingham, Ala.

In malleable castings graphite is present sometimes in a shredded or exfoliated form and it is then called crab graphite; at times it has a spheroidal form. When it is a question of gray iron treated with cerium, magnesium, etc., the form is well defined—the graphite is spheroidal. To be precise we can not be content to call these castings nodular graphite castings but rather it is necessary to call them spheroidal graphite castings.

GABRIEL JOLY, *Head*
Castings Metallurgy
Foundry Industries Technical Center
Paris, France.

The term "nodular graphite cast iron" and related terms are highly descriptive of the shape of the graphite particle, but perhaps are not so descriptive of the matter of growth. Morrogh and Williams emphasized the growth of the particle as spherulitic, the definition of spherulite indicating growth of radiating fibers. "Nodule" and "nodular graphite" are applied to graphite in malleable iron resulting from the heat treatment of white cast iron. This graphite possesses a somewhat different shape from that produced by cerium or magnesium treatment of molten iron, and it does not possess the radiating characteristics of the graphite that is found in the treated iron.

I believe, nevertheless, that the name

"nodular graphite cast iron" or some similar term should be retained for the following reasons:

First, the great majority of people will visualize the appearance of the graphite as it exists in the structure much more readily from the use of some modification of the term "nodule" than the words "spherulitic" or "spherulite."

Second, since nodule calls to mind a typical shape it may assist in a ready grasp of the properties of nodular graphite cast iron as compared to gray cast iron. Implied similarity to the shape of graphite in malleable iron will link the properties of nodular iron to malleable iron rather than to gray cast iron.

There might be some reason for encouraging the use of the term "spheroidal" on the grounds that it simultaneously describes the shape and the radiating growth of the graphite particles. However, previous usage of the term "nodular" as indicated above, and its use to describe the growth of pearlite in the transformation of austenite at certain constant subcritical temperatures, seems to recommend further application to nodular graphite cast iron.

PROF. R. W. LINDSAY
School of Mineral Industries
Pennsylvania State College
State College, Pa.

A new type of gray iron has been developed; its mechanical properties approach those of steel and its microstructure, as-cast, contains pearlite, sometimes ferrite, and graphitic carbon in compact spheres.

Since the words gray iron will be included in the name, the idea of graphite will be implied. The modifying adjectives must therefore distinguish the type of graphite contained. "Nodular" would be quite satisfactory but for the fact that the word "nodular" is currently being applied to the particles of temper carbon in malleable iron.

The word "spheroid" means similar to a sphere, and the word "spherule" means small sphere. The word "spherulitic" has a specialized meaning in geology signifying a compact small spheroid built up of radiating rods. Spheroidal or spherulitic would both be satisfactory but the latter term is longer, more difficult to pronounce, and to many Americans has an alien, affected sound. The writer's choice, therefore, would be spheroidal gray iron.

PROF. RICHARD SCHNEIDEWIND
Dept. of Metallurgy
University of Michigan
Ann Arbor, Mich.

The problem of naming the new material which in the as-cast condition contains graphite in a nodular or spheroidal form was outlined in the October, 1949, issue of *American Foundryman* (page 34) and opinions on terminology were published in that issue and in November (page 44). Opinions and reasons will continue to be published in subsequent issues of *American Foundryman* as received. —Editor.

ABSTRACTS

(Continued on Page 43)

necessary for making die castings. Figures are given for the benefit of purchasers of die castings to show the dollar volume per year of die castings necessary before they are justified in setting up their own facilities. The factors affecting production costs are briefly mentioned.

Annealing Malleable Iron

EFFECT OF SHAKEOUT TEMPERATURE. Gabriel Joly. "The Effect on Graphitization Time of White Cast Iron on the Temperature of the Casting at Time of Removal from the Mold," *Fonderie*, vol. 45, Sept. 1949, pp. 1725-1728 (in French).

Several tests were conducted to determine how the temperature of the casting at the time of removal from the mold influenced the graphitization time. It was found that pieces removed from the mold at 760 C (1400 F) graphitized in 10 to 12½ hr and showed the highest tensile strength. Pieces removed from the mold at 600 C down to room temperature required 16 to 20 hr for graphitization. Tables and photomicrographs included.

Heating the Foundry

ADVANTAGES OF GAS SPACE HEATERS. John S. Wendt. "Gas Space Heaters vs Coke Burning Salamanders," *Industrial Gas*, vol. 28, Nov. 1949, pp. 6-7, 20, 22.

Benefits of gas space heaters as compared to coke burning salamanders based on a detailed analysis made at Rosedale Foundry & Machine Co. are discussed. Advantages cited are: uniform heating, no excessive amounts of smoke and sulfurous fumes, release of 825 sq ft of floor space, and annual savings of $402 including amortization of equipment in four years; after this annual savings are $1,372.

Aluminum-Cast Iron Brake Drum

BI-METALLIC FOUNDRY PRODUCT. Charles E. Stevens, Jr., "Aluminum-iron Drum Boosts Vehicle Brake Performance," *S.A.E. Journal*, vol. 57, Nov. 1949, pp. 56-61.

A great improvement in drum-type brakes for automotive use is revealed in the tests conducted on the aluminum-cast iron brake drum. It has high heat-dissipating properties and has undergone severe testing in the laboratory and in service. The bi-metallic drum weighs less than two-thirds as much as the all cast iron drum. Diagrams, tables and photomicrographs are included.

Cast Iron

HIGH TEMPERATURE TESTS. W. C. Blott, "Growth of Cast Iron," *Iron Age*, vol. 164, Nov. 10, 1949, pp. 88-91.

Growth occurring in several different types of high strength cast iron which are subjected to elevated temperatures is discussed. Curves showing the effects of various alloying additions on growth are given and tables giving the following information are included: chemical analysis of irons tested, summary of results of growth tests, and characteristics of irons before and after growth tests.

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